2006-08 BRAKES

VSA System - Civic (All Except Hybrid)

COMPONENT LOCATION INDEX

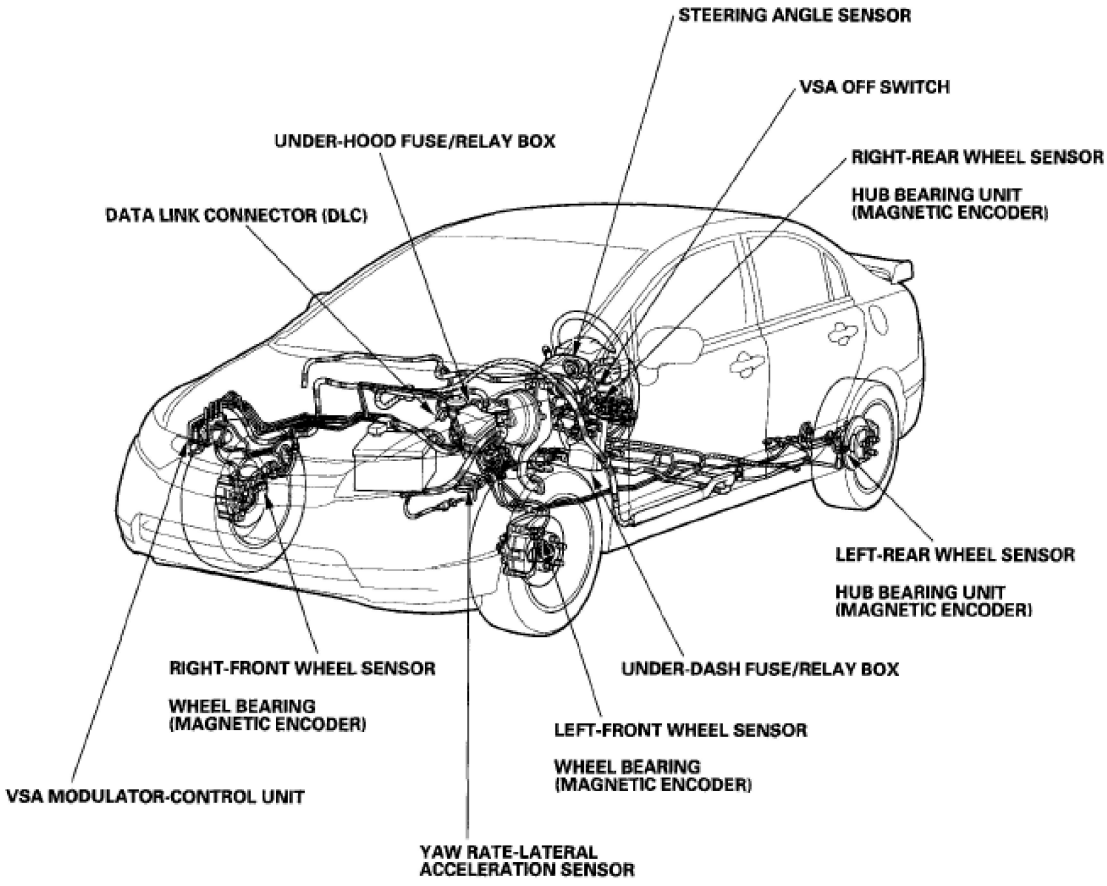


Fig. 1: Locating VSA System Components

GENERAL TROUBLESHOOTING INFORMATION

SYSTEM INDICATOR

This system has four indicators:

- ABS indicator (A)
- Brake system indicator (B)
- VSA indicator (C)
- VSA activation indicator (D)

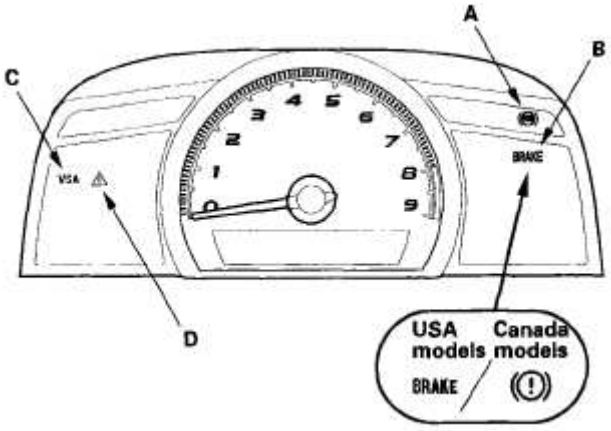


Fig. 2: Identifying System Indicator

When the system is OK, each indicator comes on for about 2 seconds after turning the ignition switch ON (II), then goes off.

When the system detects a problem, a DTC will be set and, depending upon the failure, the VSA modulator-control unit will determine which indicator(s) will be turned on. If the problem goes away (system returns to normal), the indicator(s) will be controlled in the following way depending upon the DTC that was set:

- The indicator(s) will come on and stay on when the ignition switch is ON (II).
- The indicator(s) will automatically go off.
- The indicator(s) will go off after the vehicle is driven.

ABS Indicator

The ABS indicator comes on when the ABS function is lost. The brakes still work like a conventional system.

Brake System indicator

The brake system indicator comes on when the EBD function is lost, the parking brake is applied, and/or the brake fluid level is low.

NOTE: If two or more wheel speed sensors fail, the brake system indicator will come on.

VSA Indicator

The VSA indicator comes on when the VSA function is lost.

VSA Activation Indicator

The VSA activation indicator blinks when the VSA function is activating. The VSA activation indicator comes on, when the VSA is off, or the VSA function is lost.

DIAGNOSTIC TROUBLE CODE (DTC)

- The memory can hold all DTCs. However, when the same DTC is detected more than once, the more recent DTC is written over the earlier one. Therefore, when the same problem is detected repeatedly, it is memorized as a single DTC.
- The DTCs are indicated in the order they occur.
- The DTCs are memorized in the EEPROM. Therefore, the memorized DTCs cannot be canceled by disconnecting the battery. Do the specified procedures to clear the DTCs.

SELF-DIAGNOSIS

- Self-diagnosis can be classified into two categories:
  - Initial diagnosis: Done right after the ignition switch is turned ON (II) and until the ABS and VSA indicators go off.
  - Regular diagnosis: Done right after the initial diagnosis until the ignition switch is turned OFF.
- When the system detects a problem, the VSA modulator-control unit shifts to fail-safe mode.

KICKBACK

The pump motor operates when the VSA modulator-control unit is functioning, and the fluid in the reservoir is forced out to the master cylinder, causing kickback at the brake pedal.

PUMP MOTOR

- The pump motor operates when the VSA modulator-control unit is functioning.
- The VSA modulator-control unit checks the pump motor operation during

regular diagnosis when the vehicle is driven over 10 mph (15 km/h) the first time after the ignition switch is turned ON (II). You may hear the motor operate at this time, but it is normal.

BRAKE FLUID REPLACEMENT/AIR BLEEDING

Brake fluid replacement and air bleeding procedures are identical to the procedures used on vehicles without VSA system (see **BRAKE SYSTEM BLEEDING**).

HOW TO TROUBLESHOOT DTCS

The troubleshooting procedures assume that the cause of the problem is still present and the ABS and/or VSA indicator is still on. Following a troubleshooting procedure for a code that has been cleared and does not reset can result in incorrect diagnosis.

1. Question the customer about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the ABS and/or VSA indicator came on, such as during VSA system operation, after VSA system operation, when vehicle was traveling at a certain speed, etc.
2. When the ABS or VSA indicator does not come on during the test-drive, but troubleshooting is done based on the DTC, check for loose connectors, poor contact of the terminals, etc. before you start troubleshooting.
3. After troubleshooting, or repairs are done, clear the DTCs, and test-drive the vehicle under the same conditions that originally set the DTCs. Make sure the ABS and VSA indicators do not come on.
4. Check for other unit DTCs which are connected via F-CAN, if there are DTCs that are related to F-CAN, the most likely cause was that the ignition switch was turned ON (II) with the VSA modulator-control unit connector disconnected. Clear the DTCs. Check for PGM-FI and VSA codes, and troubleshoot those first.

INTERMITTENT FAILURES

The term "intermittent failure" means a system may have had a failure, but it checks OK now. If the indicator(s) of the system does not come on, check for poor connections or loose pins at all connectors related to the circuit that you are

troubleshooting. If the indicators were on but then went out, the original problem may have been intermittent.

HOW TO USE THE HDS (HONDA DIAGNOSTIC SYSTEM)

1. If the system indicators stay on, connect the HDS to the data link connector (DLC) (A) located under the driver's side of the dashboard.

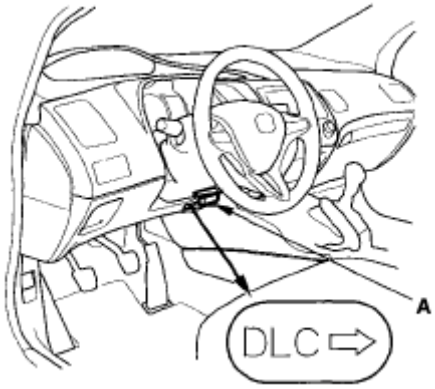


Fig. 3: Identifying DLC Connector

2. Turn the ignition switch ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't, troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
4. Check the diagnostic trouble code (DTC) and note it. Also check the on board snapshot data, and download any data found. Then refer to the indicated DTC's troubleshooting, and begin the appropriate troubleshooting procedure.

NOTE:

- **The HDS communication will be stopped when the vehicle speed is at 31 mph (50 km/h) or more.**
- **The HDS can read the DTC, current data, and other system data.**
- **For specific operations, refer to the Help menu that came with the HDS.**

HOW TO RETRIEVE DTCS

1. With the ignition switch to LOCK (0), connect the HDS to the data link connector (DLC) under the driver's side of the dashboard.
2. Turn the ignition switch ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
4. Follow the prompts on the HDS to display the DTC(s) on the screen. After determining the DTC, refer to the **DTC TROUBLESHOOTING**.
5. Turn the ignition switch to LOCK (0).

HOW TO CLEAR DTCS

1. With the ignition switch to LOCK (0), connect the HDS to the data link connector (DLC) under the driver's side of the dashboard.
2. Turn the ignition switch ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
4. Clear the DTC(s) by following the screen prompts on the HDS.
5. Turn the ignition switch to LOCK (0).

DTC TROUBLESHOOTING INDEX

DTC TROUBLESHOOTING INDEX

DTC		Detection Item	ABS Indicator	Brake System Indicator	VSA Indicator	VSA Activation Indicator
11	-13	Right-front wheel speed sensor circuit malfunction	ON	ON/OFF(1)	ON	ON
12	-11	Right-front wheel speed sensor	ON	ON/OFF(1)	ON	ON

		electrical noise or intermittent interruption				
	-12	Right-front wheel speed sensor short to the other sensor circuit	ON	ON/OFF(1)	ON	ON
	-21	Right-front wheel speed sensor installation error	ON	ON/OFF(1)	ON	ON
	-22	Right-front wheel speed sensor installation error (19 mph (30 km/h) or more)	ON	ON/OFF(1)	ON	ON
	-23	Right-front wheel speed sensor installation error (0 to 9 mph (0 to 15 km/h))	ON	ON/OFF(1)	ON	ON
13	-13	Left-front wheel speed sensor circuit malfunction	ON	ON/OFF(1)	ON	ON
14	-11	Left-front wheel speed sensor electrical noise	ON	ON/OFF(1)	ON	ON

		or intermittent interruption				
	-12	Left-front wheel speed sensor short to the other sensor circuit	ON	ON/OFF(1)	ON	ON
	-21	Left-front wheel speed sensor installation error	ON	ON/OFF(1)	ON	ON
	-22	Left-front wheel speed sensor installation error (19 mph (30 km/h) or more)	ON	ON/OFF(1)	ON	ON
	-23	Left-front wheel speed sensor installation error (0 to 9 mph (0 to 15 km/h))	ON	ON/OFF(1)	ON	ON
15	-13	Right-rear wheel speed sensor circuit malfunction	ON	ON/OFF(1)	ON	ON
16	-11	Right-rear wheel speed sensor electrical noise or intermittent	ON	ON/OFF(1)	ON	ON

		interruption				
	-12	Right-rear wheel speed sensor short to the other sensor circuit	ON	ON/OFF(1)	ON	ON
	-21	Right-rear wheel speed sensor installation error	ON	ON/OFF(1)	ON	ON
	-22	Right-rear wheel speed sensor installation error (19 mph (30 km/h) or more)	ON	ON/OFF(1)	ON	ON
	-23	Right-rear wheel speed sensor installation error (0 to 9 mph (0 to 15 km/h))	ON	ON/OFF(1)	ON	ON
17	-13	Left-rear wheel speed sensor circuit malfunction	ON	ON/OFF(1)	ON	ON
18	-11	Left-rear wheel speed sensor electrical noise or intermittent interruption	ON	ON/OFF(1)	ON	ON

	-12	Left-rear wheel speed sensor short to the other sensor circuit	ON	ON/OFF(1)	ON	ON
	-21	Left-rear wheel speed sensor installation error	ON	ON/OFF(1)	ON	ON
	-22	Left-rear wheel speed sensor installation error (19 mph (30 km/h) or more)	ON	ON/OFF(1)	ON	ON
	-23	Left-rear wheel speed sensor installation error (0 to 9 mph (0 to 15 km/h))	ON	ON/OFF(1)	ON	ON
21	-11	Right-front magnetic encoder malfunction (pulse missing)	ON	ON/OFF(1)	ON	ON
22	-11	Left-front magnetic encoder malfunction (pulse missing)	ON	ON/OFF(1)	ON	ON
23	-11	Right-rear magnetic encoder malfunction	ON	ON/OFF(1)	ON	ON

		(pulse missing)				
24	-11	Left-rear magnetic encoder malfunction (pulse missing)	ON	ON/OFF(1)	ON	ON
25	-11	Yaw rate sensor internal circuit malfunction (initial)	OFF	OFF	ON	ON
	-12	Yaw rate sensor internal circuit malfunction (open, short)	OFF	OFF	ON	ON
	-13	Yaw rate sensor communication error	OFF	OFF	ON	ON
	-14	Yaw rate/lateral acceleration sensor circuit high voltage	OFF	OFF	ON	ON
	-15	Yaw rate/lateral acceleration sensor circuit low voltage	OFF	OFF	ON	ON
	-16	Yaw rate/lateral acceleration sensor internal	OFF	OFF	ON	ON

		circuit malfunction (keep alive memory (KAM) error)				
	-21	Yaw rate sensor neutral position malfunction	OFF	OFF	ON	ON
	-22	Yaw rate sensor stuck	OFF	OFF	ON	ON
	-23	Yaw rate sensor circuit intermittent interruption	OFF	OFF	ON	ON
	-24	Yaw rate sensor gain low	OFF	OFF	ON	ON
	-25	Yaw rate sensor gain high	OFF	OFF	ON	ON
26	-11	Lateral acceleration sensor internal circuit malfunction (initial)	OFF	OFF	ON	ON
	-12	Lateral acceleration sensor internal circuit malfunction (open, short)	OFF	OFF	ON	ON
	-13	Lateral	OFF	OFF	ON	ON

		acceleration sensor communication error				
	-21	Lateral acceleration sensor neutral position malfunction	OFF	OFF	ON	ON
	-22	Acceleration sensor stuck	OFF	OFF	ON	ON
	-23	Lateral acceleration sensor circuit intermittent interruption	OFF	OFF	ON	ON
	-24	Lateral acceleration sensor gain low	OFF	OFF	ON	ON
	-25	Lateral acceleration sensor gain high	OFF	OFF	ON	ON
27	-11	Steering angle sensor DIAG signal error (initial)	OFF	OFF	ON	ON
	-21	Steering angle sensor stuck neutral position	OFF	OFF	ON	ON
	-22	Steering angle sensor stuck	OFF	OFF	ON	ON

		offset position				
	-23	Steering angle sensor counter malfunction	OFF	OFF	ON	ON
	-24	Steering angle sensor exchange malfunction	OFF	OFF	ON	ON
	-26	Steering angle sensor DIAG signal error (main)	OFF	OFF	ON	ON
31	-01	ABS right-front inlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS right-front inlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS right-front inlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS right-front inlet solenoid valve malfunction	ON	ON	ON	ON

		(solenoid stuck ON)				
32	-01	ABS right-front outlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS right-front outlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS right-front outlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS right-front outlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
33	-01	ABS left-front inlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS left-front inlet solenoid valve	ON	ON	ON	ON

		malfunction (solenoid pulse)				
	-22	ABS left-front inlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS left-front inlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
34	-01	ABS left-front outlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS left-front outlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS left-front outlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS left-front outlet solenoid	ON	ON	ON	ON

		valve malfunction (solenoid stuck ON)				
35	-01	ABS right-rear inlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS right-rear inlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS right-rear inlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS right-rear inlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
36	-01	ABS right-rear outlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS right-rear	ON	ON	ON	ON

		outlet solenoid valve malfunction (solenoid pulse)				
	-22	ABS right-rear outlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS right-rear outlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
37	-01	ABS left-rear inlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS left-rear inlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS left-rear inlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON

	-23	ABS left-rear inlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
38	-01	ABS left-rear outlet solenoid valve malfunction (solenoid initial pulse)	ON	ON	ON	ON
	-21	ABS left-rear outlet solenoid valve malfunction (solenoid pulse)	ON	ON	ON	ON
	-22	ABS left-rear outlet solenoid valve malfunction (solenoid speculative)	ON	ON	ON	ON
	-23	ABS left-rear outlet solenoid valve malfunction (solenoid stuck ON)	ON	ON	ON	ON
41	-21	Right-front wheel lock	ON	ON/OFF(1)	ON	ON
42	-21	Left-front wheel lock	ON	ON/OFF(1)	ON	ON

43	-21	Right-rear wheel lock	ON	ON/OFF(1)	ON	ON
44	-21	Left-rear wheel lock	ON	ON/OFF(1)	ON	ON
51	-11	Motor lock	ON	OFF	ON	ON
	-12	Motor lock circuit malfunction	ON	OFF	ON	ON
	-13	Motor relay OFF malfunction	ON	OFF	ON	ON
52	-12	Motor stuck OFF	ON	OFF	ON	ON
53	-01	Motor relay stuck ON 1	ON	OFF	ON	ON
	-12	Motor relay stuck ON 2	ON	OFF	ON	ON
54	-03	Fail-safe relay 1 stuck ON	ON	ON	ON	ON
	-04	Fail-safe relay 1 stuck OFF (initial)	ON	ON	ON	ON
	-21	Fail-safe relay 1 stuck OFF (main)	ON	ON	ON	ON
56	-01	Initial VIG FET stuck OFF	ON	ON	ON	ON
	-02	Initial VIG FET stuck ON	ON	ON	ON	ON
	-11	VIG FET stuck OFF	ON	ON	ON	ON
61	-01	VSA modulator-	ON	ON	ON	ON

		control unit initial IG low voltage				
	-21	VSA modulator-control unit power source low voltage 1	ON	ON	ON	ON
	-22	VSA modulator-control unit power source low voltage 2	ON	OFF	ON	ON
	-23	VSA modulator-control unit power source low voltage 3	ON	ON	ON	ON
62	-21	VSA modulator-control unit IG high voltage	ON	ON	ON	ON
64	-11	Steering angle sensor power circuit short	OFF	OFF	ON	ON
	-12	Steering angle sensor power circuit open	OFF	OFF	ON	ON
65	-21	Brake fluid level stuck ON	OFF	OFF	ON	ON
66	-11	Pressure sensor (inside of VSA modulator-control unit)	OFF	OFF	ON	ON

		malfunction				
	-12	Pressure sensor (inside of VSA modulator-control unit) malfunction	OFF	OFF	ON	ON
	-13	Pressure sensor (inside of VSA modulator-control unit) malfunction	OFF	OFF	ON	ON
	-14	Pressure sensor (inside of VSA modulator-control unit) malfunction	OFF	OFF	ON	ON
	-15	Pressure sensor (inside of VSA modulator-control unit) malfunction	OFF	OFF	ON	ON
	-16	Pressure sensor (inside of VSA modulator-control unit) malfunction	OFF	OFF	ON	ON
68	-21	Brake pedal position switch stuck OFF	OFF	OFF	ON	ON
	-22	Brake pedal position switch stuck ON	OFF	OFF	ON	ON
71	-21	Right-front or left-rear	ON	ON	ON	ON

	different diameter tire malfunction				
-22	Left-front or right-rear different diameter tire malfunction	ON	ON	ON	ON
-23	Right-front and right-rear different diameter tire malfunction	ON	ON	ON	ON
-24	Left-front and left-rear different diameter tire malfunction	ON	ON	ON	ON
-25	Right-front and left-front different diameter tire malfunction	ON	ON	ON	ON
-26	Right-rear and left-rear different diameter tire malfunction	ON	ON	ON	ON
-27	Right-front or left-rear different diameter tire malfunction	OFF	OFF	ON	ON
-28	Left-front or	OFF	OFF	ON	ON

		right-rear different diameter tire malfunction				
	-29	Right-front and right-rear different diameter tire malfunction	OFF	OFF	ON	ON
	-2A	Left-front and left-rear different diameter tire malfunction	OFF	OFF	ON	ON
	-2B	Right-front and left-front different diameter tire malfunction	OFF	OFF	ON	ON
	-2C	Right-rear and Left-rear different diameter tire malfunction	OFF	OFF	ON	ON
81	-01	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
	-02	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

-03	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-05	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-06	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-07	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-08	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-11	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-12	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

-13	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-14	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-21	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-22	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-23	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-31	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-32	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

-33	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-35	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-36	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-37	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-38	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-39	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-3A	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

-3C	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-3D	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-3E	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-40	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-41	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-42	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-51	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

-52	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-53	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-54	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-55	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-56	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-57	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
-58	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON

	-59	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
	-61	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
	-71	Central processing unit (CPU) internal circuit malfunction	ON	OFF	ON	ON
	-80	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
83	-13	ECM communication error	OFF	OFF	ON	ON
	-14	ECM communication error	OFF	OFF	ON	ON
84	-21	VSA sensor neutral position not writing	OFF	OFF	ON	ON
86	-01	F-CAN bus-off malfunction	OFF	OFF	ON	ON
	-11	F-CAN communication	OFF	OFF	ON	ON

	with ECM malfunction				
-21	F-CAN communication with engine malfunction	OFF	OFF	ON	ON
-22	F-CAN communication with engine malfunction	OFF	OFF	ON	ON
-23	F-CAN communication with engine malfunction	OFF	OFF	ON	ON
-24	F-CAN communication with engine malfunction	OFF	OFF	ON	ON
-25	F-CAN communication with engine malfunction	OFF	OFF	ON	ON
-31	F-CAN communication with gauge control module malfunction	OFF	OFF	ON	ON
-41	F-CAN communication with EAT malfunction	OFF	OFF	ON	ON
-71	F-CAN communication with yaw rate-	OFF	OFF	ON	ON

		lateral acceleration sensor malfunction				
107	-22	Central processing unit (CPU) internal circuit malfunction	OFF	OFF	OFF	ON
108	-21	Steering angle sensor malfunction	OFF	OFF	OFF	ON
112	-01	Central processing unit (CPU) internal circuit malfunction	ON	ON	ON	ON
121	-01	VSA solenoid valve malfunction	ON	ON	ON	ON
	-02	VSA solenoid valve malfunction	ON	ON	ON	ON
	-11	VSA solenoid valve malfunction	ON	ON	ON	ON
	-21	VSA solenoid valve malfunction	ON	ON	ON	ON
	-24	VSA solenoid valve malfunction	ON	ON	ON	ON
122	-01	VSA solenoid valve	ON	ON	ON	ON

		malfunction				
	-21	VSA solenoid valve malfunction	ON	ON	ON	ON
	-22	VSA solenoid valve malfunction	ON	ON	ON	ON
	-23	VSA solenoid valve malfunction	ON	ON	ON	ON
123	-01	VSA solenoid valve malfunction	ON	ON	ON	ON
	-02	VSA solenoid valve malfunction	ON	ON	ON	ON
	-11	VSA solenoid valve malfunction	ON	ON	ON	ON
	-21	VSA solenoid valve malfunction	ON	ON	ON	ON
	-24	VSA solenoid valve malfunction	ON	ON	ON	ON
124	-01	VSA solenoid valve malfunction	ON	ON	ON	ON
	-21	VSA solenoid valve malfunction	ON	ON	ON	ON
	-22	VSA solenoid valve malfunction	ON	ON	ON	ON

	-23	VSA solenoid valve malfunction	ON	ON	ON	ON

(1) Brake system indicator turns ON when two or more wheel speed sensors fail.

SYMPTOM TROUBLESHOOTING INDEX

When the vehicle has one of these symptoms, check for a diagnostic trouble code (DTC) with the HDS. If there is no DTC, do the diagnostic procedure for the symptom, in the sequence listed, until you find the cause.

SYMPTOM TROUBLESHOOTING INDEX

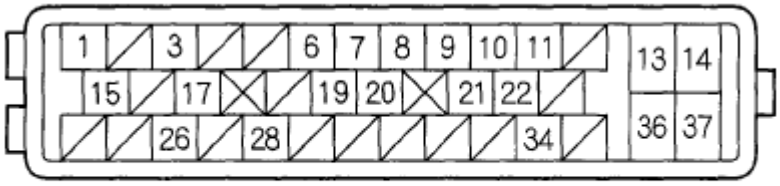
Symptom	Diagnostic procedure
HDS does not communicate with the VSA modulator-control unit or the vehicle	Troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
ABS indicator does not come on	1. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**). 2. Substitute a known-good VSA modulator-control unit, then recheck. If it is OK, replace the original VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).
ABS indicator or VSA indicator does not go off, and no DTCs are stored	1. Symptom Troubleshooting (see **SYMPTOM TROUBLESHOOTING**). 2. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**).
Brake system indicator does not	1. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**). 2. Substitute a known-good VSA modulator-control unit, then recheck. If it is OK, replace the original

come on	VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).
Brake system indicator does not go off, and no DTCs are stored	1. Symptom Troubleshooting (see **SYMPTOM TROUBLESHOOTING**). 2. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**).
VSA indicator does not come on	1. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**). 2. Substitute a known-good VSA modulator-control unit, then recheck. If it is OK, replace the original VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).
VSA activation indicator does not come on at start-up (bulb check)	1. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**). 2. Substitute a known-good VSA modulator-control unit, then recheck. If it is OK, replace the original VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).
VSA activation indicator does not go off, and no DTCs are stored	1. Symptom Troubleshooting (see **SYMPTOM TROUBLESHOOTING**). 2. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**). 3. Substitute a known-good VSA modulator-control unit, then recheck. If it is OK, replace the original VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).
ABS indicator, brake system indicator, and VSA indicator do not	1. Symptom Troubleshooting (see **SYMPTOM TROUBLESHOOTING**).

go off at same time	2. Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**).

SYSTEM DESCRIPTION

VSA MODULATOR-CONTROL UNIT INPUTS AND OUTPUTS FOR 37P CONNECTOR



Wire side of female terminals

Fig. 4: Identifying VSA Modulator-Control Unit Inputs And Outputs For 37P Connector

SYSTEM DESCRIPTION

Terminal number	Wire color	Terminal sign	Description	Measurement (Disconnect the VSA modulator-control unit 37P connector)		
				Terminals	Conditions	Results
1	RED	CAN-L	F-CAN communication circuit			
3	BLU	STR-D	Detects steering angle sensor signal			
6	PNK	FR-GND	Detects right-front wheel speed sensor signal			
7	ORN	SVCC	Power source for the steering angle sensor			
			Detects left-			

8	PUR	RL-GND	rear wheel speed sensor signal	-	-	-
9	LTGRN	RR+B	Detects right-rear wheel speed sensor signal			
10	BRN	SGND	Ground for the steering angle sensor			
11	RED(1) GRY(2)	FL-GND	Detects left-front wheel speed sensor signal			
13	WHT	FSR+B	Power source for the fail-safe relay	13-GND	At all times	Battery voltage
14	RED	MR+B	Power source for the motor relay	14-GND	At all times	Battery voltage
15	WHT	CAN-H	F-CAN communication circuit	-	-	-
17	PUR	STR-B	Detects steering angle sensor signal			
19	GRN	FR+B	Detects right-front wheel speed sensor signal			
20	YEL(1) (2)BLU	RL+B	Detects left-rear wheel speed sensor signal			

21	BLU(1) WHT(2)	RR-GND	Detects right-rear wheel speed sensor signal			
22	WHT(1) ORN(2)	FL+B	Detects left-front wheel speed sensor signal			
26	LTBLU	K-LINE	Communication with HDS			
28	GRY	IG1	Power source for activating the system	28-GND	Ignition switch ON (II)	Battery voltage
34	GRN	STR-A	Detects steering angle sensor signal	-	-	-
36	BLK	GND	Ground for the VSA modulator-control unit	36-GND	At all times	Continuity
37	BLK	MR-GND	Ground for the pump motor	37-GND	At all times	Continuity

(1) 4-door

(2) 2-door

System Outline

This system is composed of the VSA modulator-control unit, the wheel speed sensor, the steering angle sensor, and the yaw rate-lateral acceleration sensor, and the system indicators in the gauge control module (tach). The VSA modulator-control unit controls the ABS, EBD, TCS, VSA, and brake assist with the brake pressure of each wheel and the engine torque.

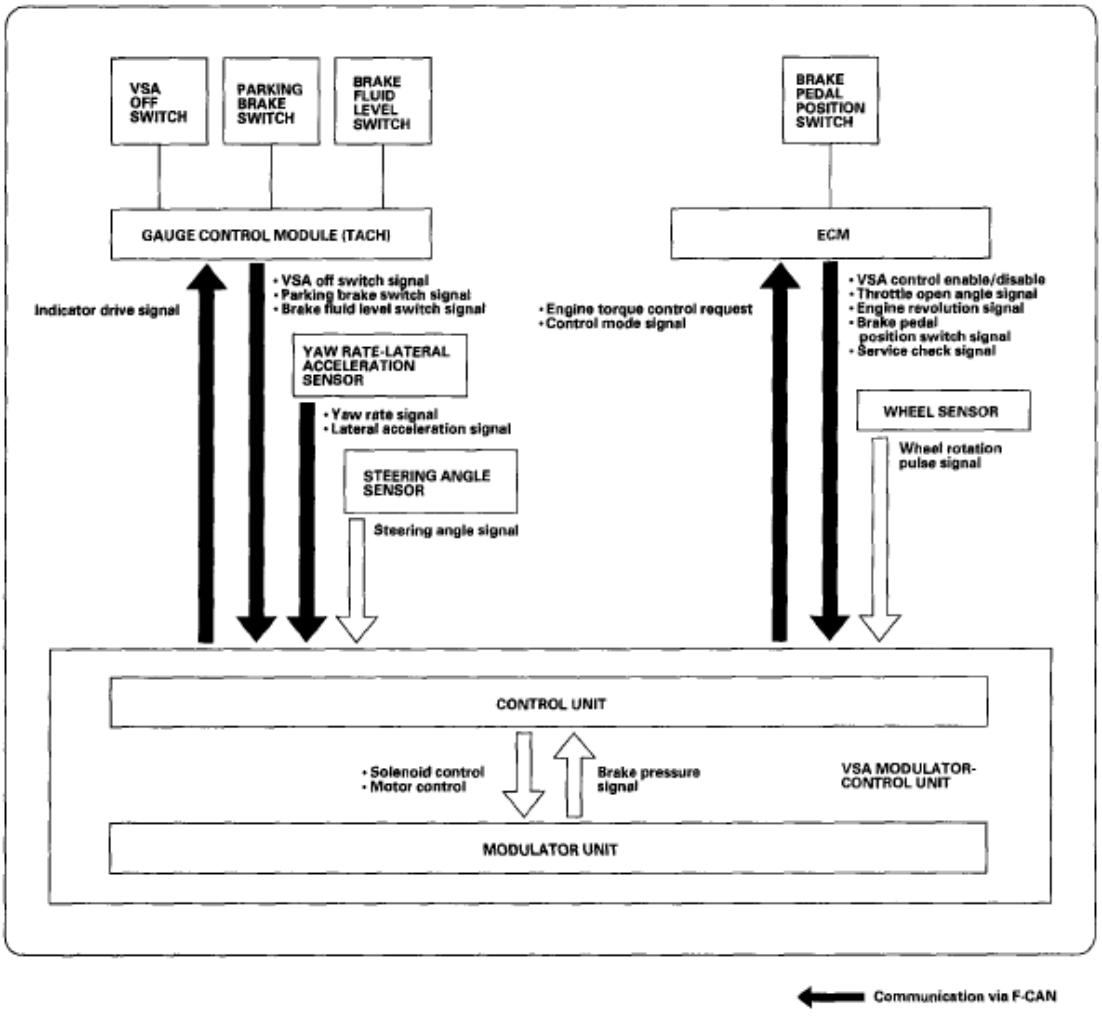


Fig. 5: Identifying VSA System Outline

ABS Features

Anti-lock control

Without ABS, when the brake pedal is pressed while driving, the wheels sometimes lock before the vehicle comes to a stop. In such an event, the maneuverability of the vehicle is reduced if the front wheels are locked, and the stability of the vehicle is reduced if the rear wheels are locked, creating an extremely unstable condition. With ABS, the system precisely controls the slip rate of the wheels to ensure maximum grip force from the tires, and it thereby ensures maneuverability and stability of the vehicle. The ABS calculates the slip rate of the wheels based on the four wheel speeds, then it controls the brake fluid pressure to reach the target slip

rate.

Grip force of tire and road surface

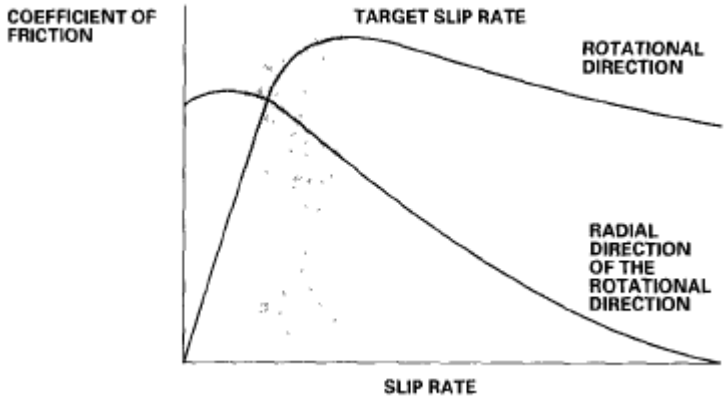


Fig. 6: Identifying Grip Force Of Tire And Road Surface Graph

Main Control

The control unit detects the wheel speed based on the wheel speed sensor signals it received, then it calculates the vehicle speed based on the detected wheel speed. The control unit detects the vehicle speed during deceleration based on the rate of deceleration.

The control unit calculates the slip rate of each wheel, and transmits the control signal to the modulator unit solenoid valve when the slip rate is high.

The hydraulic control has three modes: Pressure intensifying, pressure reducing, and pressure retaining.

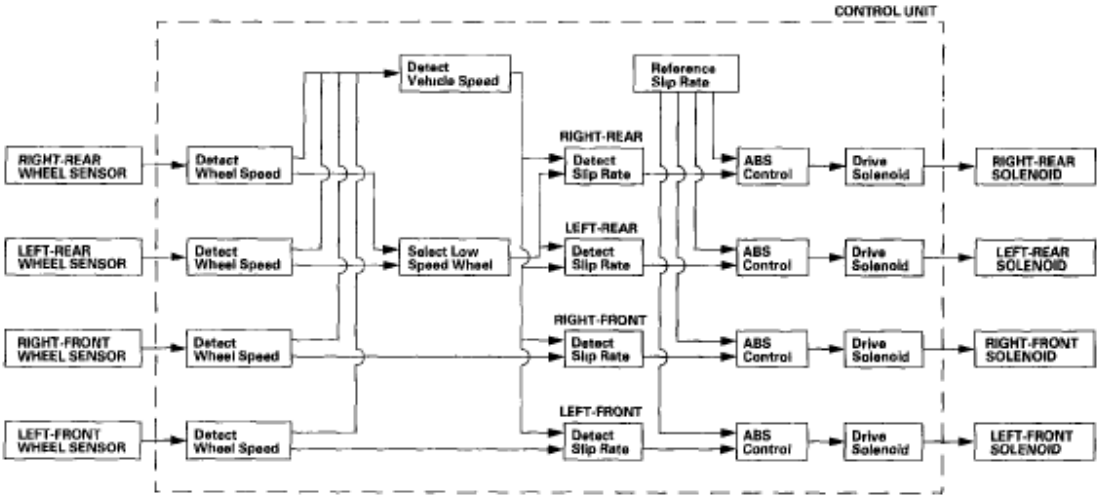


Fig. 7: Identifying Hydraulic Control Unit Graph

EBD Features

The electronic brake distribution (EBD) feature helps control vehicle braking by adjusting the rear brake force in accordance with the rear wheel load before the ABS operates. Based on the wheel speed sensor signals, the control unit uses the modulator to control the rear brakes individually. When the rear wheel speed is less than the front wheel speed, the VSA modulator-control unit retains the current rear brake fluid pressure by closing the inlet valve in the modulator. As the rear wheel speed increases and approaches the front wheel speed, the VSA modulator-control unit increases the rear brake fluid pressure by momentarily opening the inlet valve. This whole process is repeated very rapidly. While this is happening, there is kickback at the brake pedal.

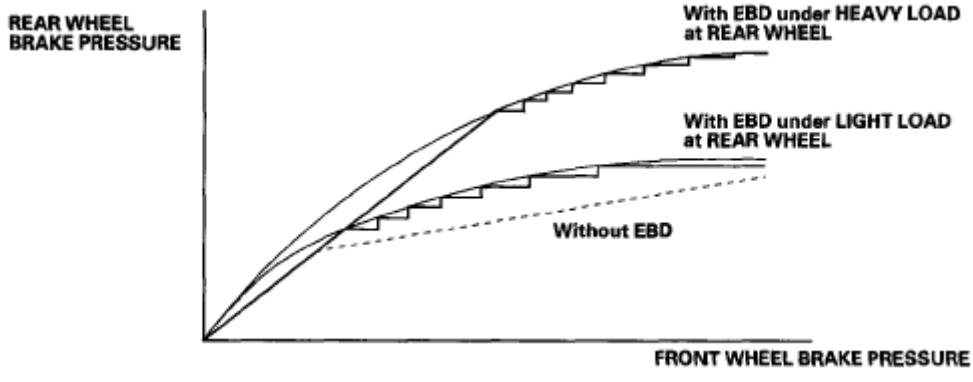

REAR WHEEL BRAKE PRESSURE
With EBD under HEAVY LOAD at REAR WHEEL
With EBD under LIGHT LOAD at REAR WHEEL
Without EBD
FRONT WHEEL BRAKE PRESSURE

Fig. 8: Identifying Electronic Brake Distribution Graph

TCS Features

When a drive wheel loses traction on a slippery road surface and starts to spin, the VSA modulator-control unit applies brake pressure to the spinning wheel and sends engine torque control request to the ECM to slow the spinning wheel and keep traction.

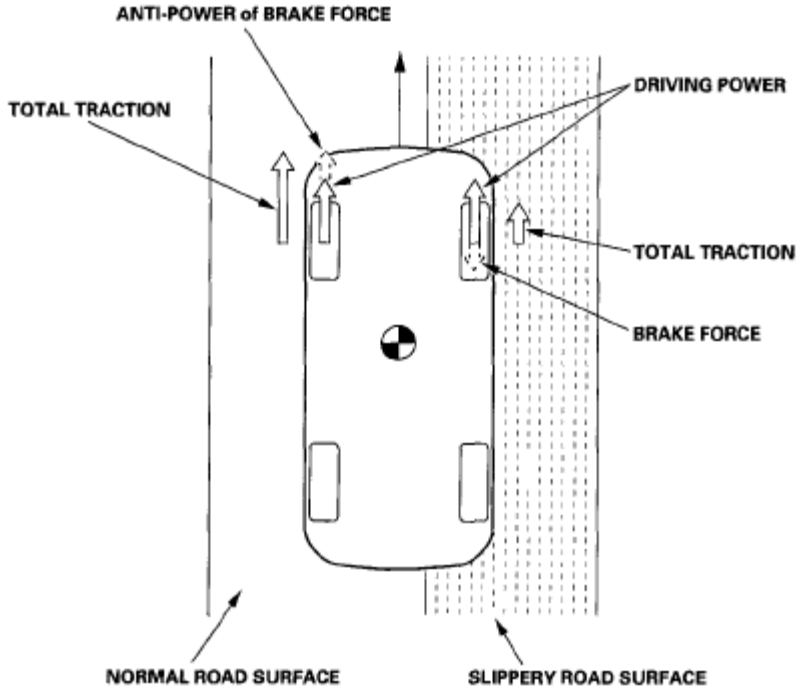


Fig. 9: Identifying Total Traction

VSA System Features

Oversteer control

Applies the brake to the front and rear outside wheels

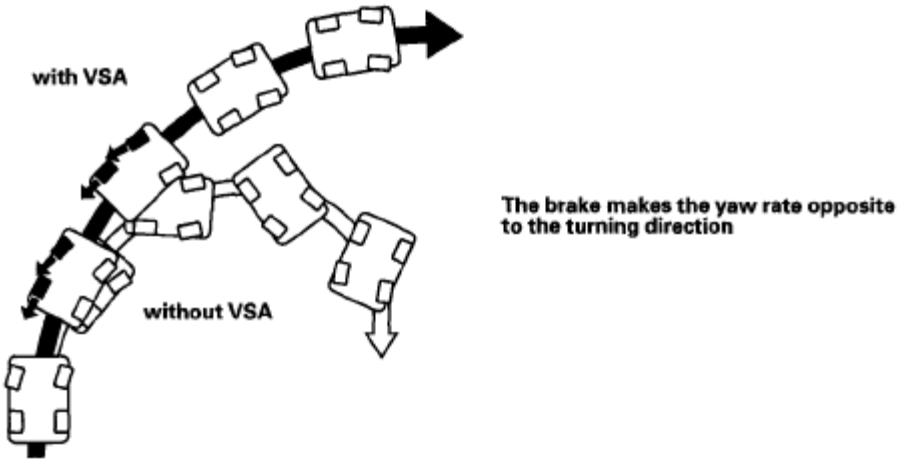


Fig. 10: Identifying VSA System - Oversteer Control

Understeer control

- Applies the brake to the front and rear inside wheels
- Controls the engine torque when accelerating

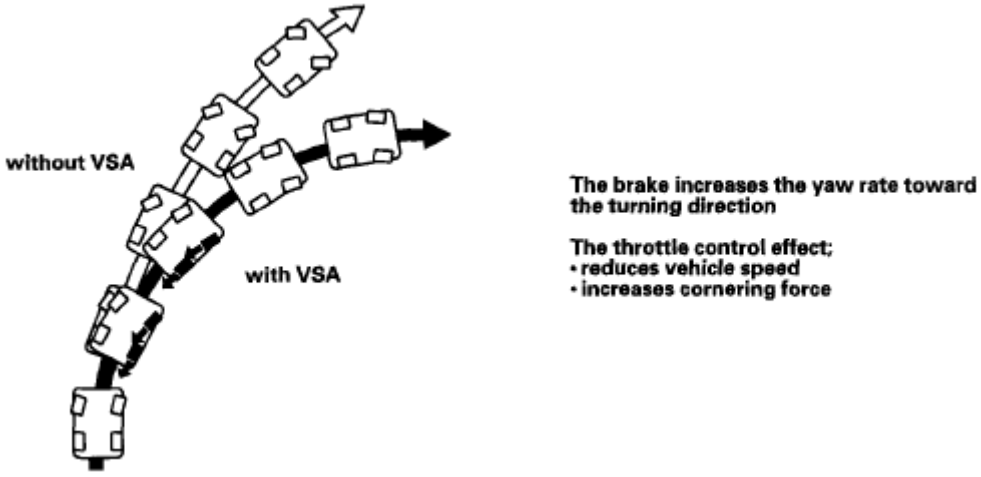

without VSA
with VSA
The brake increases the yaw rate toward the turning direction
The throttle control effect;
• reduces vehicle speed
• increases cornering force

Fig. 11: Identifying VSA System - Understeer Control

Brake Assist Features

Brake assist helps ensure that any driver can achieve the full braking potential of the vehicle by increasing brake system pressure in a panic situation, bringing the vehicle into a full ABS stop.

Each time the ignition switch is turned ON (II), the VSA modulator-control unit

learns the current driver's normal braking characteristics by monitoring the brake pressure sensor and the brake pedal position switch at each stop. Using these inputs and their values, the VSA modulator-control unit is able to learn the driver's normal braking habits, and then determine the difference between a normal stop and a panic stop for the individual driver of the vehicle. If during a panic stop the VSA modulator-control unit determines that the brake system pressure increases above a learned threshold in less than a learned amount of time, the VSA modulator-control unit engages brake assist. Because the brake system pressure crossed the threshold before the time threshold had expired, the VSA modulator-control unit goes into brake assist mode.

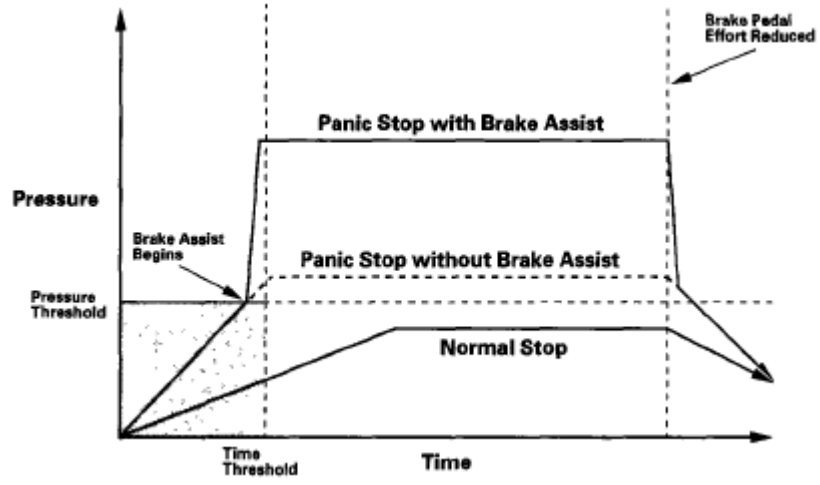


Fig. 12: Identifying Brake Assist Features

Modulator Unit

The modulator unit consists of the inlet solenoid valve, the outlet solenoid valve, the VSA NO (normally open) solenoid valve, the VSA NC (normally closed) solenoid valve, the reservoir, the pump, the pump motor, and the damping chamber.

The hydraulic control has three modes at ABS action; pressure intensifying, pressure retaining, and pressure reducing.

And pressure adding mode is combined at TCS, VSA, and brake assist action.

The hydraulic circuit is an independent four channel type; one channel for each wheel.

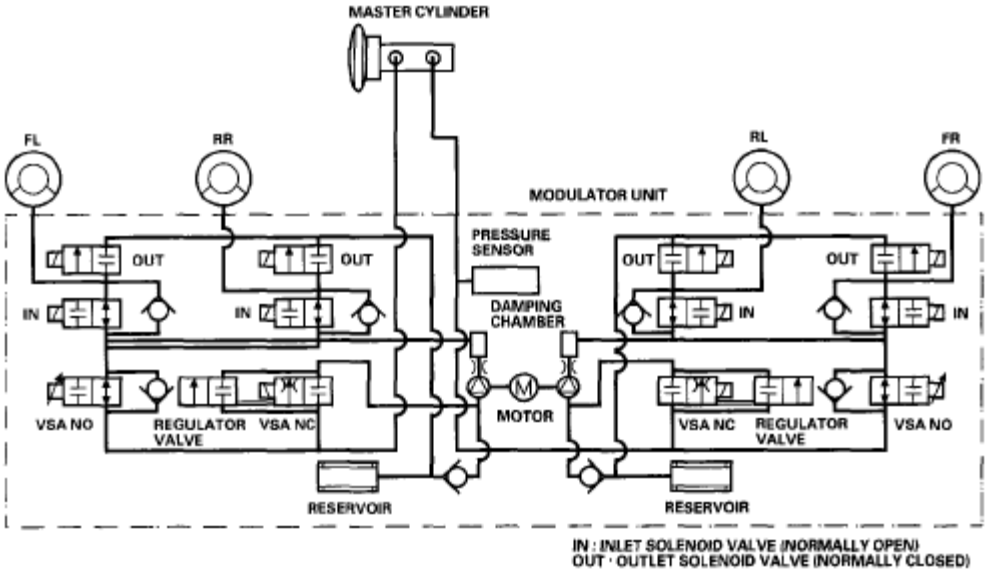


Fig. 13: Identifying Modulator Unit Diagram

VALVE REFERENCE

Mode	VSA NO Valve	VSA NC Valve	Inlet Solenoid Valve	Outlet Solenoid Valve	Brake Fluid
Pressure intensifying mode	open	closed	open	closed	Master cylinder fluid is pumped out to the caliper.
Pressure retaining mode	open	closed	closed	closed	Caliper fluid is retained by the inlet and outlet valves.
Pressure reducing mode	open	closed	closed	open	• Caliper fluid flows through the outlet valve to the reservoir. • The motor pumps the reservoir fluid through the damping chamber to the master cylinder(1).

Pressure adding mode	closed	open	open	closed	• Master cylinder fluid is pumped out by pump with motor through VSA NC valve to the caliper. • Caliper fluid pressure exceed master cylinder pressure.
(1) The motor will keep running until the operation of the one anti-lock brake control is finished with the first pressure reducing mode.					

CIRCUIT DIAGRAM

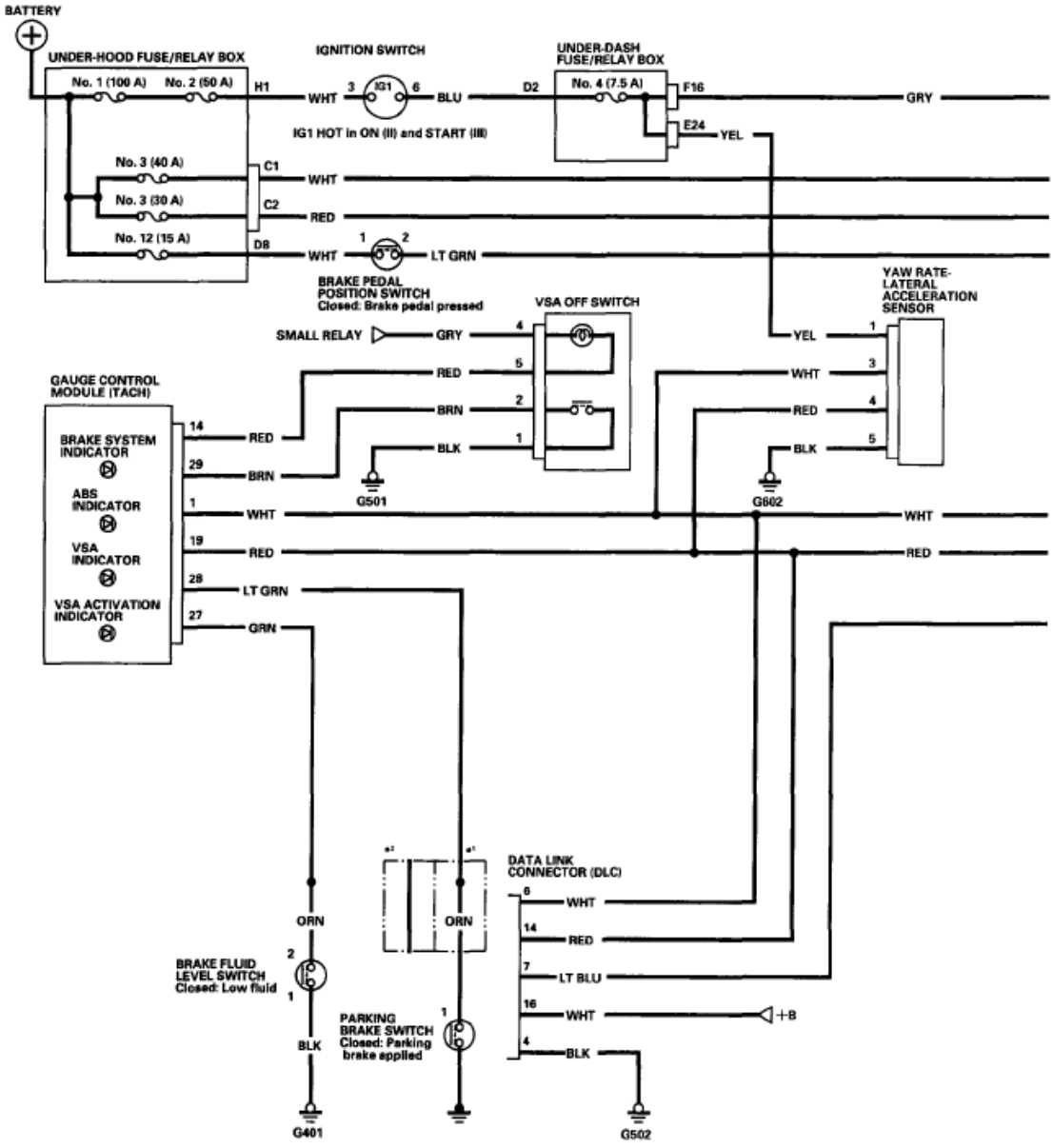


Fig. 14: Identifying VSA System Circuit Diagram (1 Of 3)

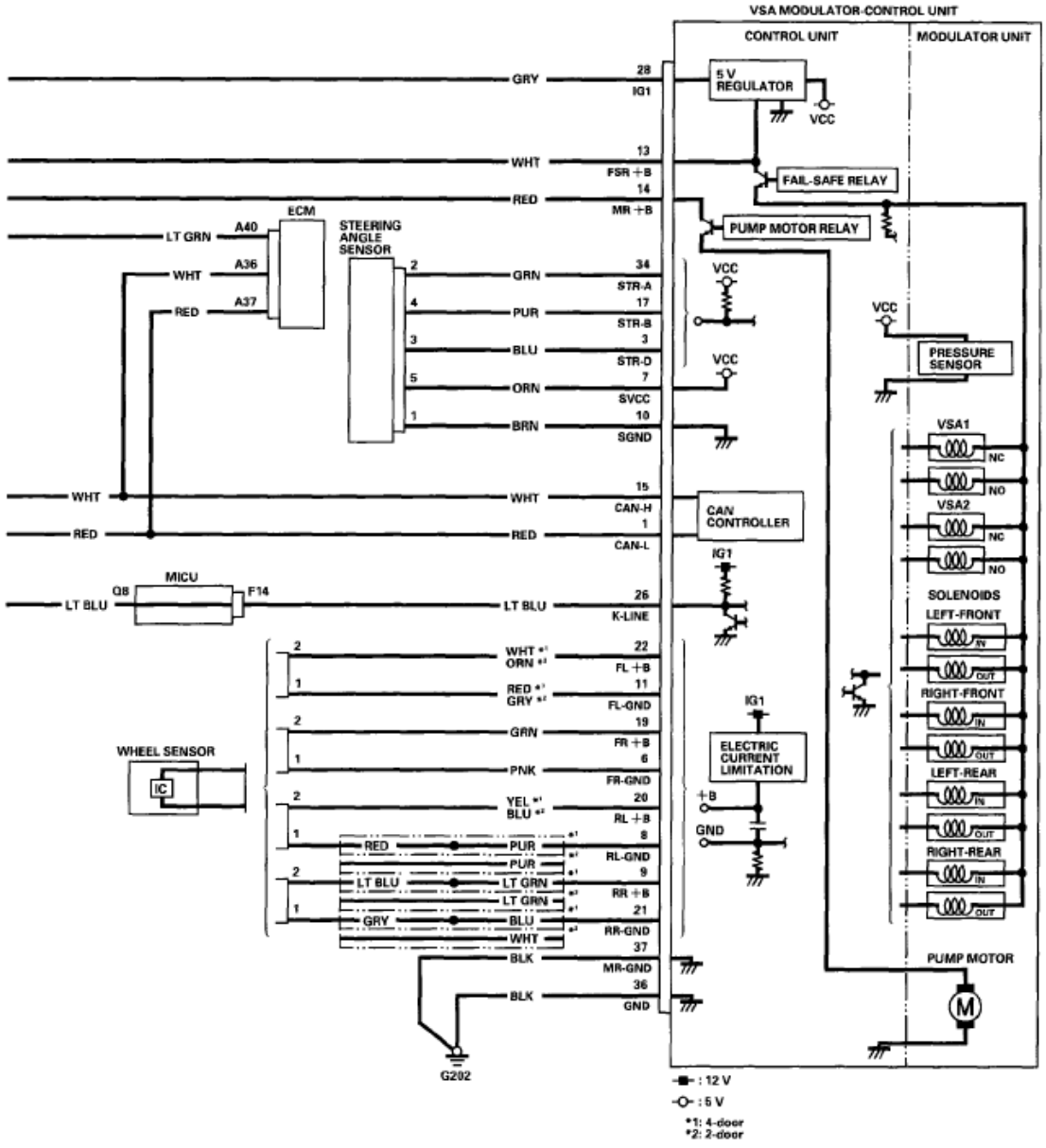


Fig. 15: Identifying VSA System Circuit Diagram (2 Of 3)

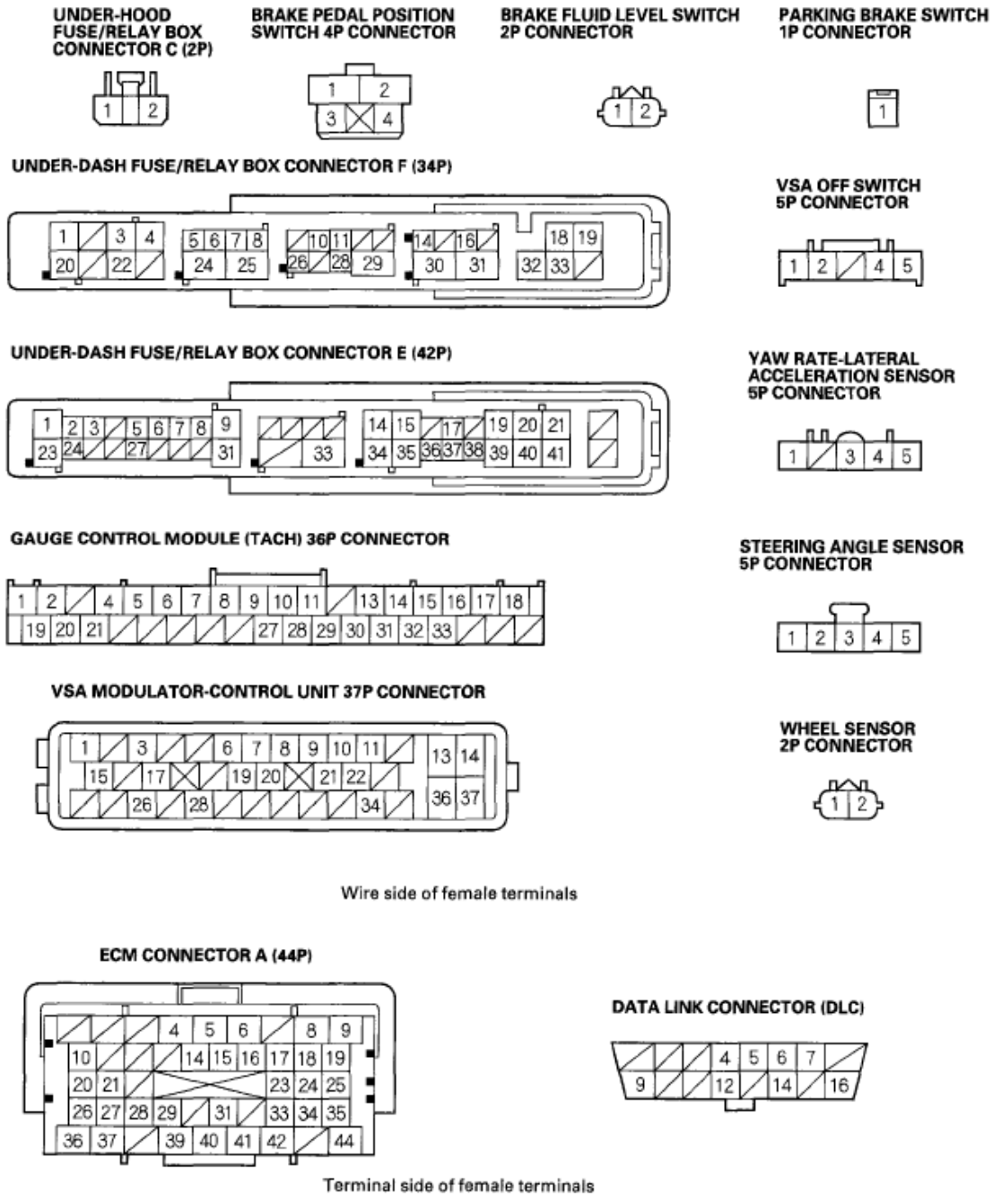

UNDER-HOOD FUSE/RELAY BOX CONNECTOR C (2P)
BRAKE PEDAL POSITION SWITCH 4P CONNECTOR
BRAKE FLUID LEVEL SWITCH 2P CONNECTOR
PARKING BRAKE SWITCH 1P CONNECTOR
UNDER-DASH FUSE/RELAY BOX CONNECTOR F (34P)
VSA OFF SWITCH 5P CONNECTOR
UNDER-DASH FUSE/RELAY BOX CONNECTOR E (42P)
YAW RATE-LATERAL ACCELERATION SENSOR 5P CONNECTOR
GAUGE CONTROL MODULE (TACH) 36P CONNECTOR
STEERING ANGLE SENSOR 5P CONNECTOR
VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
WHEEL SENSOR 2P CONNECTOR
Wire side of female terminals
ECM CONNECTOR A (44P)
DATA LINK CONNECTOR (DLC)
Terminal side of female terminals

Fig. 16: Identifying VSA System Circuit Diagram (3 Of 3)

DTC TROUBLESHOOTING

DTC 11-13: RIGHT-FRONT WHEEL SPEED SENSOR CIRCUIT MALFUNCTION; DTC 13-13: LEFT-FRONT WHEEL SPEED SENSOR CIRCUIT MALFUNCTION; DTC 15-13: RIGHT-REAR WHEEL SPEED SENSOR CIRCUIT MALFUNCTION; DTC 17-13: LEFT-REAR WHEEL SPEED SENSOR CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 11-13, 13-13, 15-13, and/or 17-13 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Disconnect the VSA modulator-control unit 37P connector.
7. Check for continuity between the appropriate VSA modulator-control unit 37P connector wheel speed sensor +B and GND terminals (see table), then check for continuity between the same terminals and reverse the positive and negative tester probes.

DTC REFERENCE

DTC	VSA Modulator-control Unit 37P Connector Terminal No.	
11-13	No. 19	No. 6
13-13	No. 22	No. 11
15-13	No. 9	No. 21
17-13	No. 20	No. 8

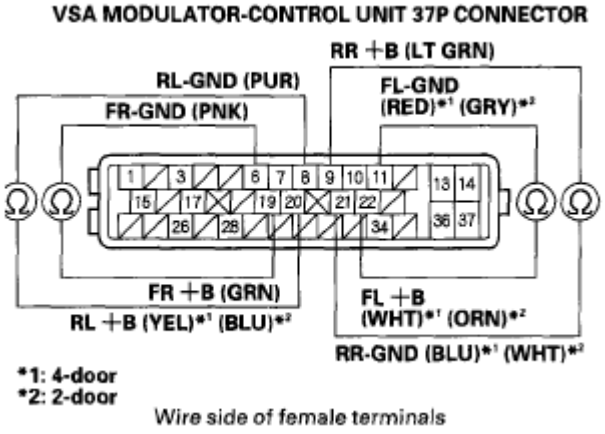


Fig. 17: Checking Continuity Between Appropriate VSA Modulator-Control Unit 37P Connector Wheel Speed Sensor +B

Is there continuity in both directions?

YES -Go to step 8.

NO -If there is no continuity in either direction, go to step 10. If there is continuity in only one direction, go to step 12.

8. Disconnect the appropriate wheel speed sensor 2P connector.
9. On the sensor side, check for continuity between appropriate wheel speed sensor 2P connector terminals No. 1 and No. 2, then check for continuity between the same terminals and reverse the positive and negative tester probes.

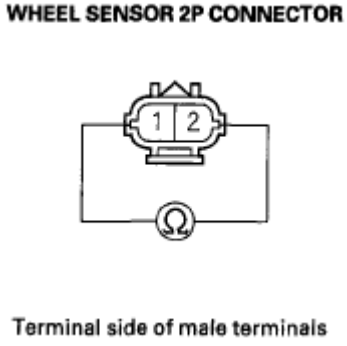


Fig. 18: Checking Continuity Between Appropriate Wheel Speed Sensor 2P Connector Terminals No. 1 And No. 2

Is there continuity in both direction?

YES -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

NO -Repair short in the wire between the appropriate wheel speed sensor and the VSA modulator-control unit.

10. Disconnect the appropriate wheel speed sensor 2P connector.
11. On the sensor side, check for continuity between appropriate wheel speed sensor 2P connector terminals No. 1 and No. 2, then check for continuity between the same terminals and reverse the positive and negative tester probes.

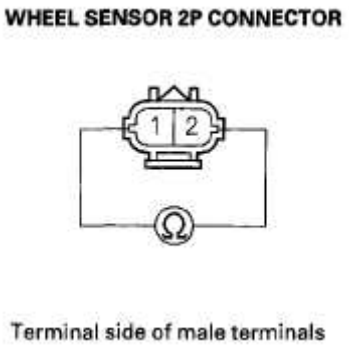


Fig. 19: Checking Continuity Between Appropriate Wheel Speed Sensor 2P Connector Terminals No. 1 And No. 2

Is there continuity in only one direction?

YES -Repair open in the wire between the appropriate wheel speed sensor and the VSA modulator-control unit.

NO -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

12. Check for continuity between body ground and the appropriate VSA modulator-control unit 37P connector terminal (see table).

DTC REFERENCE

DTC	VSA Modulator-control Unit 37P Connector Terminal No.	
11-13	No. 19	No. 6
13-13	No. 22	No. 11

15-13	No. 9	No. 21
17-13	No. 20	No. 8

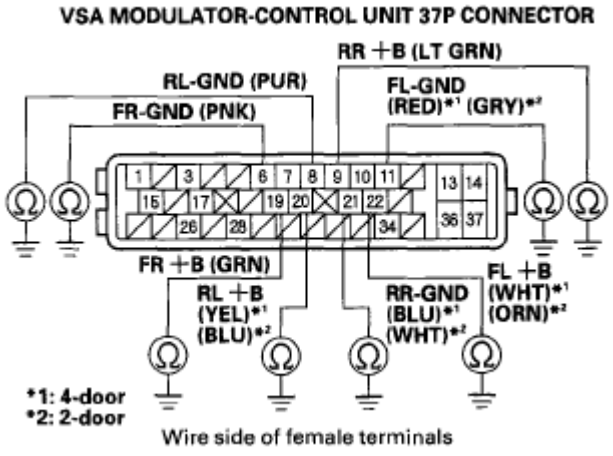


Fig. 20: Checking Continuity Between Body Ground And Appropriate VSA Modulator-Control Unit 37P Connector Terminal

Is there continuity?

YES -Go to step 13.

NO -Go to step 15.

13. Disconnect the appropriate wheel speed sensor 2P connector.
14. On the sensor side, check for continuity between body ground and appropriate wheel speed sensor 2P connector terminal No. 1 and No. 2 individually.

NOTE: Check the wheel speed sensor while mounted on the vehicle

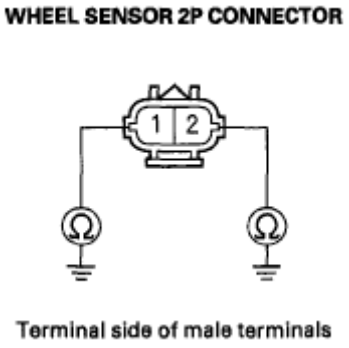


Fig. 21: Checking Continuity Between Body Ground And Appropriate Wheel Speed Sensor 2P Connector Terminal No. 1 And No. 2

Is there continuity?

YES -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

NO -Repair short to body ground in the wire between the appropriate wheel speed sensor and the VSA modulator-control unit.

15. Turn the ignition switch ON (II).
16. Measure voltage between body ground and the appropriate VSA modulator-control unit 37P connector terminal (see table).

DTC REFERENCE

DTC	VSA Modulator-control Unit 37P Connector Terminal No.	
11-13	No. 19	No. 6
13-13	No. 22	No. 11
15-13	No. 9	No. 21
17-13	No. 20	No. 8

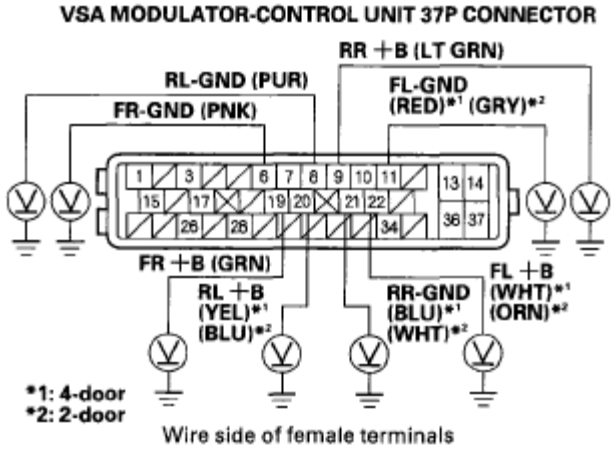


Fig. 22: Measuring Voltage Between Body Ground And Appropriate VSA Modulator-Control Unit 37P Connector Terminal

Is there 0.1 V or more?

YES -Repair short to power in the wire between the appropriate wheel speed sensor and the VSA modulator-control unit.

NO -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

DTC 12-11: RIGHT-FRONT WHEEL SPEED SENSOR ELECTRICAL NOISE OR INTERMITTENT INTERRUPTION; DTC 14-11: LEFT-FRONT WHEEL SPEED SENSOR ELECTRICAL NOISE OR INTERMITTENT INTERRUPTION; DTC 16-11: RIGHT-REAR WHEEL SPEED SENSOR ELECTRICAL NOISE OR INTERMITTENT INTERRUPTION; DTC 18-11: LEFT-REAR WHEEL SPEED SENSOR ELECTRICAL NOISE OR INTERMITTENT INTERRUPTION

NOTE: These DTCs may be caused by electrical interference. Check for aftermarket devices installed in the vehicle when these DTC are indicated.

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle.
4. Check for DTCs with the HDS.

Is DTC 12-11, 14-11, 16-11, and/or 18-11 indicated?

YES -lf the DTC 12-12,14-12,16-12, or 18-12 is indicated at the same time, do the DTC 12-12, 14-12,16-12, or 18-12 troubleshooting (see **DTC 12-12: Right-front Wheel Speed Sensor Short to the Other Sensor Circuit; DTC 14-12: Left-front Wheel Speed Sensor Short to the Other Sensor Circuit; DTC 16-12: Right-rear Wheel Speed Sensor Short to the Other Sensor Circuit; DTC 18-12: Left-rear Wheel Speed Sensor Short to the Other Sensor Circuit**). If DTC 12-12, 14-12,16-12 or 18-12 is not indicated, go to step 5.

NO -Troubleshoot the indicated DTC. If there are no DTCs indicated, there may be an intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Check that the appropriate wheel speed sensor is properly mounted (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC REFERENCE

DTC	Appropriate Wheel Speed Sensor
12-11	Right-front
14-11	Left-front
16-11	Right-rear
18-11	Left-rear

Is the wheel speed sensor installation OK?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Reinstall the wheel speed sensor, and check the mounting position (see

WHEEL SPEED SENSOR REPLACEMENT).

DTC 12-12: RIGHT-FRONT WHEEL SPEED SENSOR SHORT TO THE OTHER SENSOR CIRCUIT; DTC 14-12: LEFT-FRONT WHEEL SPEED SENSOR SHORT TO THE OTHER SENSOR CIRCUIT; DTC 16-12: RIGHT-REAR WHEEL SPEED SENSOR SHORT TO THE OTHER SENSOR CIRCUIT; DTC 18-12: LEFT-REAR WHEEL SPEED SENSOR SHORT TO THE OTHER SENSOR CIRCUIT

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle. Drive the vehicle at 13 mph (20 km/h) or more, and go a distance of 328 ft (100 m) or more.

NOTE: Drive the vehicle on the road, not on the lift.

4. Check for DTCs with the HDS.

   Is DTC 12-12, 14-12, 16-12, and/or 18-12 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Disconnect VSA modulator-control unit 37P connector.
7. Check for continuity between the appropriate VSA modulator-control unit 37P connector wheel speed sensor +B terminals (see table).

DTC REFERENCE

DTC	VSA Modulator-control Unit 37P Connector Terminal No.			
	Appropriate Terminal	Other Terminals		
12-12	No. 19	No. 22	No. 9	No. 20
14-12	No. 22	No. 19	No. 9	No. 20
16-12	No. 9	No. 19	No. 22	No. 20

18-12	No. 20	No. 19	No. 22	No. 9

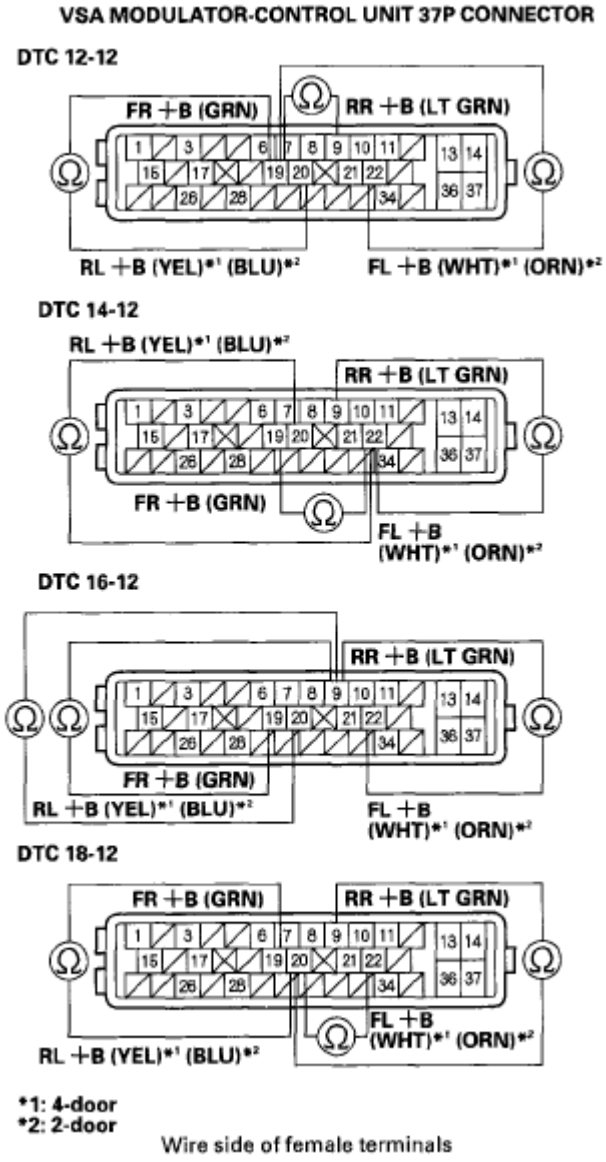


Fig. 23: Checking Continuity Between Appropriate VSA Modulator-Control Unit 37P Connector Wheel Speed Sensor +B Terminals

Is there continuity?

YES -Repair short in the wires between the appropriate wheel speed sensor and the VSA modulator-control unit.

NO -Check for loose terminals in the VSA modulator-control unit 37P

connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

DTC 12-21: RIGHT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR; DTC 14-21: LEFT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR; DTC 16-21: RIGHT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR; DTC 18-21: LEFT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR

1. Test-drive the vehicle. Drive the vehicle at 7 mph (10 km/h).

   NOTE: Drive the vehicle on the road, not on the lift.

2. Check the RF, LF, RR, LR WHEEL SPD in the VSA DATA LIST with the HDS.

   Are all four the same indicated value?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 3.

3. Turn the ignition switch to LOCK (0).
4. Check that the appropriate wheel speed sensor is properly mounted (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC REFERENCE

DTC	Appropriate Wheel Speed Sensor
12-21	Right-front
14-21	Left-front
16-21	Right-rear
18-21	Left-rear

Is the wheel speed sensor installation OK?

YES -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

NO -Reinstall the wheel speed sensor, and check the mounting position (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC 12-22: RIGHT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR (19 MPH (30 KM/H) OR MORE); DTC 14-22: LEFT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR (19 MPH (30 KM/H) OR MORE); DTC 16-22: RIGHT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR (19 MPH (30 KM/H) OR MORE); DTC 18-22: LEFT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR (19 MPH (30 KM/H) OR MORE)

1. Test-drive the vehicle. Drive the vehicle between 19 mph (30 km/h) and 31 mph (50 km/h) for 70 seconds or more.

   NOTE: Drive the vehicle on the road, not on the lift.

2. Check the RF, LF, RR, LR WHEEL SPD in the VSA DATA LIST with the HDS.

   Are all four the same indicated value?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 3.

3. Turn the ignition switch to LOCK (0).
4. Check that the appropriate wheel speed sensor is properly mounted (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC REFERENCE

DTC	Appropriate Wheel Speed Sensor
12-22	Right-front
14-22	Left-front
16-22	Right-rear

18-22	Left-rear

Is the wheel speed sensor installation OK?

YES -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

NO -Reinstall the wheel speed sensor, and check the mounting position (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC 12-23: RIGHT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR (0 TO 9 MPH (0 TO 15 KM/H)); DTC 14-23: LEFT-FRONT WHEEL SPEED SENSOR INSTALLATION ERROR (0 TO 9 MPH (0 TO 15 KM/H)); DTC 16-23: RIGHT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR (0 TO 9 MPH (0 TO 15 KM/H)); DTC 18-23: LEFT-REAR WHEEL SPEED SENSOR INSTALLATION ERROR (0 TO 9 MPH (0 TO 15 KM/H))

1. Test-drive the vehicle. Drive the vehicle between 1 mph (1 km/h) and 9 mph (15 km/h) in a straight line.

   NOTE: Drive the vehicle on the road, not on the lift.

2. Check the RF, LF, RR, LR WHEEL SPD in the VSA DATA LIST with the HDS.

   Are all the same indicated values?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 3.

3. Turn the ignition switch to LOCK (0).
4. Check that the appropriate wheel speed sensor is properly mounted (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC REFERENCE

DTC	Appropriate Wheel Speed Sensor
12-23	Right-front
14-23	Left-front
16-23	Right-rear
18-23	Left-rear

Is the wheel speed sensor installation OK?

YES -Replace the appropriate wheel speed sensor (see **WHEEL SPEED SENSOR REPLACEMENT**).

NO -Reinstall the wheel speed sensor, and check the mounting position (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC 21-11: RIGHT-FRONT MAGNETIC ENCODER MALFUNCTION (PULSE MISSING); DTC 22-11: LEFT-FRONT MAGNETIC ENCODER MALFUNCTION (PULSE MISSING); DTC 23-11: RIGHT-REAR MAGNETIC ENCODER MALFUNCTION (PULSE MISSING); DTC 24-11: LEFT-REAR MAGNETIC ENCODER MALFUNCTION (PULSE MISSING)

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle. Drive the vehicle at 13 mph (20 km/h) or more, and go a distance of 328 ft (100 m) or more.

NOTE: Drive the vehicle on the road, not on the lift.

4. Check for DTCs with the HDS.

   Is DTC 21-11, 22-11,23-11, and/or 24-11 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Inspect the appropriate magnetic encoder for debris or cracks.

DTC REFERENCE

DTC	Appropriate Magnetic Encoder	Note
21-11	Right-front	Remove the driveshaft outboard joint from the appropriate wheel hub (see **KNUCKLE/HUB REPLACEMENT**).
22-11	Left-front	
23-11	Right-rear	Remove the hub bearing unit (see **HUB BEARING UNIT REPLACEMENT-DISC BRAKE TYPE**).
24-11	Left-rear	

Is the magnetic encoder surface OK?

YES -Replace the wheel bearing (front) or the hub bearing unit (rear):

- Front: Replace the front wheel bearing (see **KNUCKLE/HUB REPLACEMENT**).
- Rear: Replace the rear hub bearing unit (see **HUB BEARING UNIT REPLACEMENT-DISC BRAKE TYPE**).

NO -Clean off dust or dirt from the appropriate magnetic encoder surface on the wheel bearing or the hub bearing unit, then go to step 1 and recheck. If the DTC is still present, replace the appropriate wheel bearing or hub bearing unit.

DTC 25-11: YAW RATE SENSOR INTERNAL CIRCUIT MALFUNCTION (INITIAL); DTC 25-12: YAW RATE SENSOR INTERNAL CIRCUIT MALFUNCTION (OPEN, SHORT); DTC 25-13: YAW RATE SENSOR COMMUNICATION ERROR; DTC 25-16: YAW RATE/LATERAL ACCELERATION SENSOR INTERNAL CIRCUIT MALFUNCTION (KEEP ALIVE MEMORY (KAM) ERROR); DTC 25-21: YAW RATE SENSOR NEUTRAL POSITION MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.

3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
5. Check for DTCs with the HDS.

   Is DTC 25-11, 25-12, 25-13, 25-16, or 25-21 indicated?

   YES -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 25-14: YAW RATE/LATERAL ACCELERATION SENSOR CIRCUIT HIGH VOLTAGE; DTC 25-15: YAW RATE/LATERAL ACCELERATION SENSOR CIRCUIT LOW VOLTAGE

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
5. Check for DTCs with the HDS.

   Is DTC 25-14, or 25-15 indicated?

   YES -lf the DTC 61-01,61-21,61-22,61-23, and/or 62-21 is indicated at the same time, check the battery performance (see **BATTERY TEST**), and do the alternator and regulator circuit troubleshooting (see **ALTERNATOR AND REGULATOR CIRCUIT TROUBLESHOOTING**). If the DTC 61-01, 61-21,61-22, 61-23, and/or 62-21 is not indicated at the same time, replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 25-22: YAW RATE SENSOR STUCK

1. Turn the ignition switch ON (II).

2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Turn the ignition switch to LOCK (0).
5. Test-drive the vehicle. Drive the vehicle at 7 mph (10 km/h) or more.
6. Check for DTCs with the HDS.

   Is DTC 25-22 indicated?

   YES -Go to step 7.

   NO -If any DTCs are indicated, go to the indicated DTCs troubleshooting. If DTCs are not indicated, intermittent failure, the system is OK at this time.

7. Check the LATERAL ACCELERATION SENSOR and YAW RATE S in the VSA DATA LIST with the HDS.

   Is there 0 °/s indicated?

   YES -Go to step 8.

   NO -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

8. Test-drive the vehicle. Check the YAW RATE S in the VSA DATA LIST with the HDS while driving in corners.

   Does the indicated value change?

   YES -Intermittent failure, the system is OK at this time.

   NO -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

DTC 25-23: YAW RATE SENSOR CIRCUIT INTERMITTENT INTERRUPTION

1. Turn the ignition switch ON (II).

2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
5. Wait 10 seconds or more.
6. Check for DTCs with the HDS.

   Is DTC 25-23 indicated?

   YES -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 25-24: YAW RATE SENSOR GAIN LOW; DTC 25-25: YAW RATE SENSOR GAIN HIGH; DTC 26-24: LATERAL ACCELERATION SENSOR GAIN LOW; DTC 26-25: LATERAL ACCELERATION SENSOR GAIN HIGH

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Test-drive the vehicle. Drive the vehicle at 10 mph (15 km/h)or more.
5. Check for DTCs with the HDS.

   Is DTC 25-24, 25-25, 26-24, or 26-25 indicated?

   YES -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 26-11: LATERAL ACCELERATION SENSOR INTERNAL CIRCUIT MALFUNCTION (INITIAL); DTC 26-12: LATERAL ACCELERATION SENSOR INTERNAL CIRCUIT MALFUNCTION (OPEN, SHORT); DTC 26-13: LATERAL ACCELERATION SENSOR COMMUNICATION ERROR; DTC 26-21: LATERAL ACCELERATION SENSOR NEUTRAL POSITION MALFUNCTION; DTC 26-23: LATERAL ACCELERATION SENSOR CIRCUIT INTERMITTENT INTERRUPTION

NOTE: While doing this troubleshooting, avoid vibration or shaking of the vehicle.

1. Park the vehicle on a flat and level surface.
2. Turn the ignition switch ON (II).
3. Clear the DTC with the HDS.
4. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
5. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
6. Wait 15 seconds or more.
7. Check for DTCs with the HDS.

   Is DTC 26-11, 26-12, 26-13, 26-21, or 26-23 indicated?

   YES -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 26-22: ACCELERATION SENSOR STUCK

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 26-22 indicated?

   YES -Go to step 5.

   NO -If any DTCs are indicated, go to the indicated DTCs troubleshooting. If DTCs are not indicated, intermittent failure, the system is OK at this time.

5. Check the LATERAL ACCELERATION SENSOR and YAW RATE S in the VSA DATA LIST with the HDS.

Is there 0 °/s indicated?

YES -Go to step 6.

NO -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

6. Test-drive the vehicle. Check the YAW RATE S in the VSA DATA LIST with the HDS while driving in corners.

   Does the indicated value change?

   YES -Intermittent failure, the system is OK at this time.

   NO -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

DTC 27-11: STEERING ANGLE SENSOR DIAG SIGNAL ERROR (INITIAL); DTC 27-26: STEERING ANGLE SENSOR DIAG SIGNAL ERROR (MAIN)

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 27-11, or 27-26 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between the steering angle sensor 5P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Disconnect the steering angle sensor 5P connector.
7. Disconnect the VSA modulator-control unit 37P connector.

8. Check for continuity between steering angle sensor 5P connector terminal No. 3 and body ground.

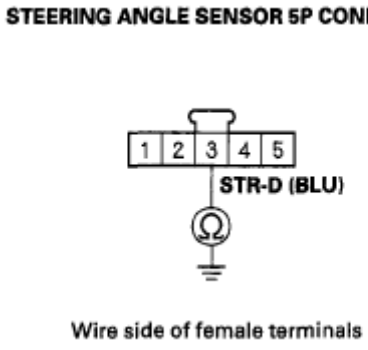


Fig. 24: Checking Continuity Between Steering Angle Sensor 5P Connector Terminal No. 3 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Go to step 9.

9. Check for continuity between the VSA modulator-control unit 37P connector terminal and the steering angle sensor 5P connector terminal individually.

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	Steering Angle Sensor
STR-D	3	3
SVCC	7	5
SGND	10	1

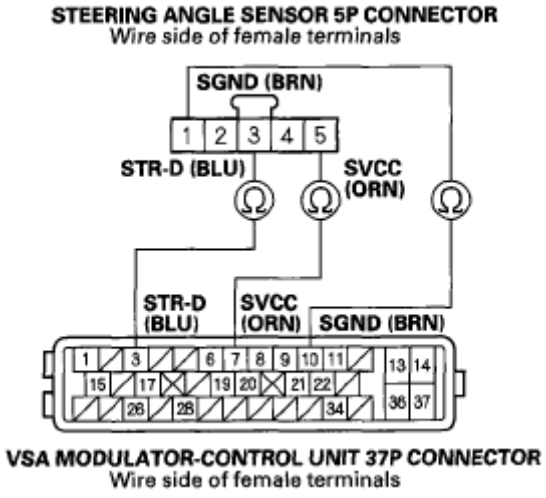


Fig. 25: Checking Continuity Between VSA Modulator-Control Unit And Steering Angle Sensor Connector Terminal

Is there continuity?

YES -Go to step 10.

NO -Repair open in the wire between the steering angle sensor and the VSA modulator-control unit.

10. Turn the ignition switch ON (II).
11. Measure voltage between steering angle sensor 5P connector terminal No. 3 and body ground.

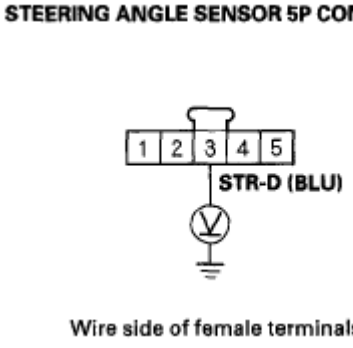


Fig. 26: Measuring Voltage Between Steering Angle Sensor 5P Connector Terminal No. 3 And Body Ground

Is there 0.1 V or more?

YES -Repair short to power in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Replace the steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).

DTC 27-21: STEERING ANGLE SENSOR STUCK NEUTRAL POSITION; DTC 27-22: STEERING ANGLE SENSOR STUCK OFFSET POSITION

1. Turn the ignition switch ON (II).
2. Turn the steering wheel left and right at 90 degree or more. Check the STEERING ANGLE in the VSA DATA LIST with the HDS.

   Is there ±90° or more?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the steering angle sensor 5P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 3.

3. Turn the ignition switch to LOCK (0).
4. Disconnect the steering angle sensor 5P connector.
5. Disconnect the VSA modulator-control unit 37P connector.
6. Check for continuity between body ground and steering angle sensor 5P connector terminals No. 2 and No. 4 individually.

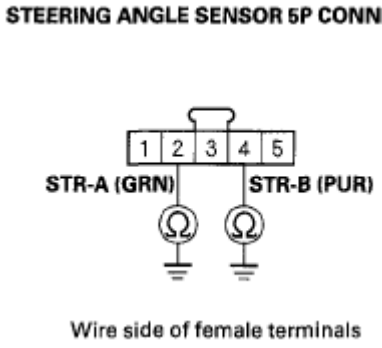


Fig. 27: Checking Continuity Between Body Ground And Steering Angle Sensor 5P Connector Terminals No. 2 And No. 4

Is there continuity?

YES -Repair short to body ground in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Go to step 7.

7. Check for continuity between the VSA modulator-control unit 37P connector terminal and the steering angle sensor 5P connector terminal individually.

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	Steering Angle Sensor
STR-A	34	2
STR-B	17	4
SVCC	7	5
SGND	10	1

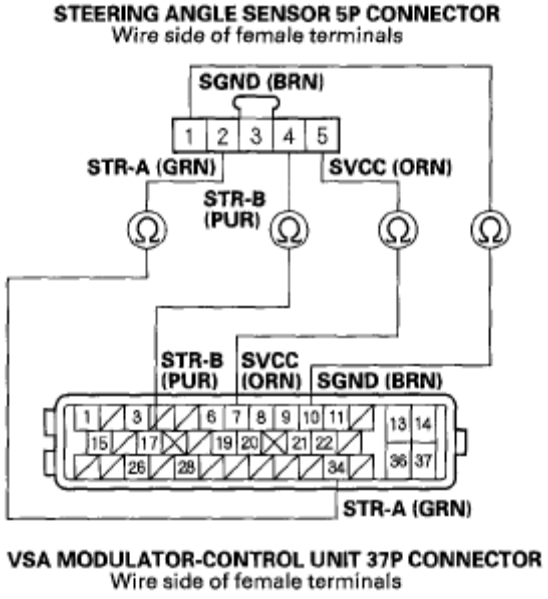


Fig. 28: Checking Continuity Between VSA Modulator-Control Unit And Steering Angle Sensor 5P Connector Terminal

Is there continuity?

YES -Go to step 8.

NO -Repair open in the wire between the steering angle sensor and the VSA modulator-control unit.

8. Check for continuity between steering angle sensor 5P connector terminals No. 2 and No. 4.

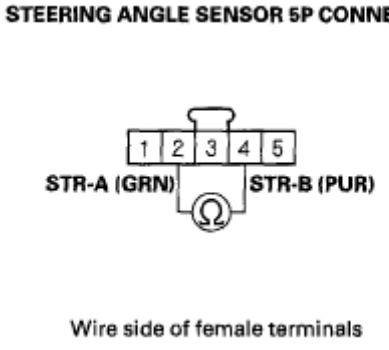


Fig. 29: Checking Continuity Between Steering Angle Sensor 5P Connector Terminals No. 2 And No. 4

Is there continuity?

YES -Repair short in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Go to step 9.

9. Check for continuity between steering angle sensor 5P connector terminals No. 5 and No. 2, No. 5 and No. 4 individually.

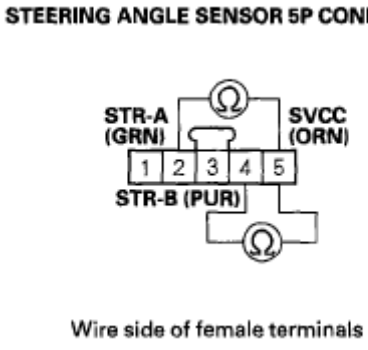


Fig. 30: Checking Continuity Between Steering Angle Sensor 5P Connector Terminals No. 5 And No. 2, No. 5 And No. 4

Is there continuity?

YES -Repair short in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Go to step 10.

10. Check for continuity between steering angle sensor 5P connector terminals No. 1 and No. 2, No. 1 and No. 4 individually.

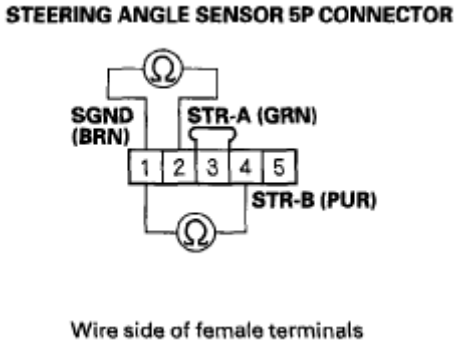


Fig. 31: Checking For Continuity Between Steering Angle Sensor 5P Connector Terminals No. 1 And No. 2

Is there continuity?

YES -Repair short in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Go to step 11.

11. Turn the ignition switch ON (II).
12. Measure voltage between body ground and steering angle sensor 5P connector terminals No. 2 and No. 4 individually.

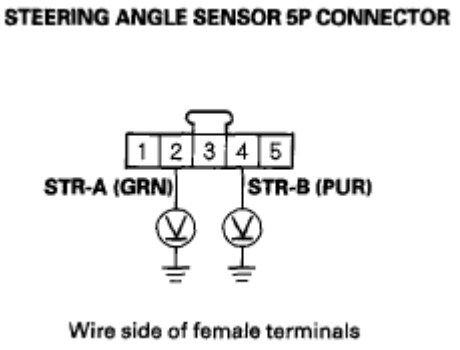


Fig. 32: Measuring Voltage Between Body Ground And Steering Angle Sensor 5P Connector Terminals No. 2 And No. 4

Is there 0.1 V or more?

YES -Repair short to power in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Replace the steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).

DTC 27-23: STEERING ANGLE SENSOR COUNTER MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Turn the steering wheel from lock to lock.
5. Check for DTCs with the HDS.

Is DTC 27-23 indicated?

YES -Replace the steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).

NO -Intermittent failure, the system is OK at this time.

DTC 27-24: STEERING ANGLE SENSOR EXCHANGE MALFUNCTION

1. Turn the ignition switch ON (II).
2. Turn the steering wheel 1 turn. Check the STEERING ANGLE in the VSA DATA LIST with the HDS.

Is there about 288-432 °?

YES -Intermittent failure, the system is OK at this time.

NO -Replace the steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).

DTC 31-XX*: ABS RIGHT-FRONT INLET SOLENOID VALVE MALFUNCTION; DTC 32-XX*: ABS RIGHT-FRONT OUTLET SOLENOID VALVE MALFUNCTION; DTC 33-XX*: ABS LEFT-FRONT INLET SOLENOID VALVE MALFUNCTION; DTC 34-XX*: ABS LEFT-FRONT OUTLET SOLENOID VALVE MALFUNCTION; DTC 35-XX*: ABS RIGHT-REAR INLET SOLENOID VALVE MALFUNCTION; DTC 36-XX*: ABS RIGHT-REAR OUTLET SOLENOID VALVE MALFUNCTION; DTC 37-XX*: ABS LEFT-REAR INLET SOLENOID VALVE MALFUNCTION; DTC 38-XX*: ABS LEFT-REAR OUTLET SOLENOID VALVE MALFUNCTION

*: Subcode

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

DTC REFERENCE

Subcode	Malfunction	Note (DTC)
01	Solenoid Initial Pulse	31-01, 32-01, 33-01, 34-01, 35-01, 36-01, 37-01, 38-01
21	Solenoid Pulse	31-21, 32-21, 33-21, 34-21, 35-21, 36-21, 37-21, 38-21
22	Solenoid Speculative	31-22, 32-22, 33-22, 34-22, 35-22, 36-22, 37-22, 38-22
23	Solenoid Stuck ON	31-23, 32-23, 33-23, 34-23, 35-23, 36-23, 37-23, 38-23

Is DTC 31-xx, 32-xx, 33-xx, 34-xx, 35-xx, 36-xx, 37-xx, or 38-xx indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 41-21: RIGHT-FRONT WHEEL LOCK; DTC 42-21: LEFT-FRONT WHEEL LOCK; DTC 43-21: RIGHT-REAR WHEEL LOCK; DTC 44-21: LEFT-REAR WHEEL LOCK

The DTCs may be indicated under these conditions:

- The vehicle goes into a spin.
- The ABS or VSA continues to operate for a long time.
- Snow build-up on the wheel speed sensor.
- Misadjusted brake switch.
- Contaminated brake fluid.

1. Raise the vehicle, and support it with safety stands in the proper locations (see **LIFT AND SUPPORT POINTS**).
2. Turn the appropriate wheel by hand.

DTC REFERENCE

DTC	Appropriate Wheel
41-21	Right-front
42-21	Left-front
43-21	Right-rear
44-21	Left-rear

Is there brake drag?

YES -Repair the brake drag.

NO -Go to step 3.

3. Check the appropriate wheel speed sensor is properly mounted (see **WHEEL SPEED SENSOR REPLACEMENT**).

Is the wheel speed sensor installation OK?

YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the wheel speed sensor 2P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see). If the vehicle continues to code, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Reinstall the wheel speed sensor, and check the mounting position (see **WHEEL SPEED SENSOR REPLACEMENT**).

DTC 51-11: MOTOR LOCK; DTC 51-13: MOTOR RELAY OFF MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.

3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Wait 5 seconds.
5. Operate SOLENOID or VSA in the VSA FUNCTION TEST five times with the HDS.
6. Check for DTCs with the HDS.

   Is DTC 51-11 or 51-13 indicated?

   YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

   NO -Intermittent failure, the system is OK at this time.

DTC 51-12: MOTOR LOCK CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check the DTCs with the HDS.

   Is DTC 51-12 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals at the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Check the No. 3 MTR (30 A) fuse in the under-hood fuse/relay box.

   Is the fuse blown?

   YES -Go to step 7.

   NO -Reinstall the checked fuse, then go to step 9.

7. Disconnect the VSA modulator-control unit 37P connector.
8. Check for continuity between VSA modulator-control unit 37P connector terminal No. 14 and body ground.

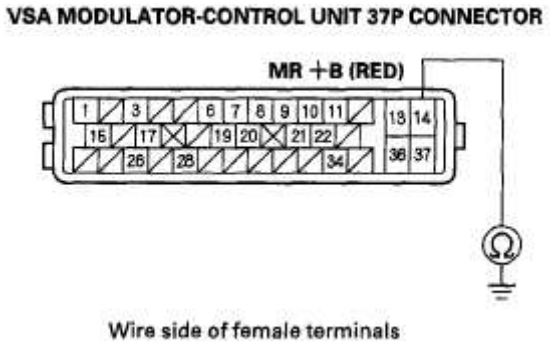


Fig. 33: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminal No. 14 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the No. 3 MTR (30 A) fuse in the under-hood fuse/relay box and the VSA modulator-control unit.

NO -Install the new No. 3 MTR (30 A) fuse in the under-hood fuse/relay box, then go to step 10.

9. Disconnect the VSA modulator-control unit 37P connector.
10. Measure voltage between VSA modulator-control unit 37P connector terminal No. 14 and body ground.

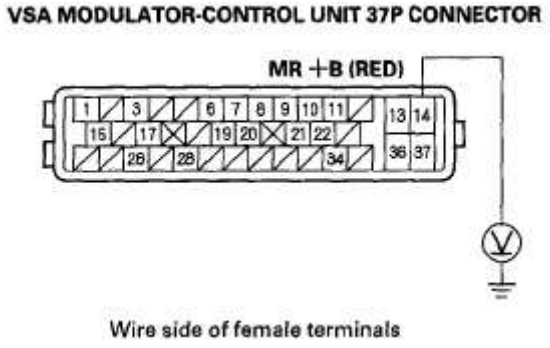


Fig. 34: Measuring Voltage Between VSA Modulator-Control Unit 37P

Connector Terminal No. 14 And Body Ground

Is there battery voltage?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the No. 3 MTR (30 A) fuse in the under-hood fuse/relay box and the VSA modulator-control unit.

DTC 52-12: MOTOR STUCK OFF

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Operate each SOLENOID or VSA in the VSA FUNCTION TEST five times with the HDS.
5. Check for DTCs with the HDS.

Is DTC 52-12 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 53-01: MOTOR RELAY STUCK ON 1; DTC 53-12: MOTOR RELAY STUCK ON 2

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

Is DTC 53-01 or 53-12 indicated?

YES -Go to step 5.

NO -Intermittent failure, the system is OK at this time. Check for loose terminals at the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Disconnect the VSA modulator-control unit 37P connector.
7. Check for continuity between VSA modulator-control unit 37P connector terminal No. 37 and body ground.

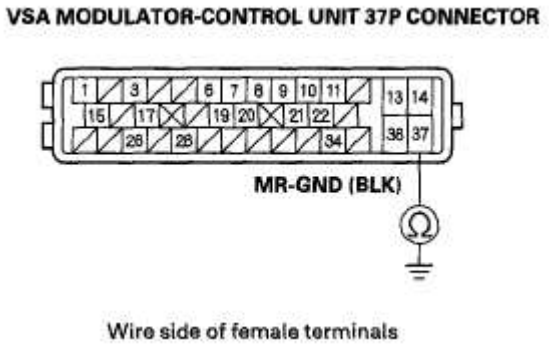


Fig. 35: Checking For Continuity Between VSA Modulator-Control Unit 37P Connector Terminal No. 37 And Body Ground

Is there continuity?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the VSA modulator-control unit and body ground (G202).

DTC 54-03: FAIL-SAFE RELAY 1 STUCK ON; DTC 54-04: FAIL-SAFE RELAY 1 STUCK OFF (INITIAL); DTC 54-21: FAIL-SAFE RELAY 1 STUCK OFF (MAIN)

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.

3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

Is DTC 54-03, 54-04, or 54-21 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 56-01: INITIAL VIG FET STUCK OFF; DTC 56-02: INITIAL VIG FET STUCK ON; DTC 56-11: VIG FET STUCK OFF

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

Is DTC 56-01, 56-02, or 56-11 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 61-01: VSA MODULATOR-CONTROL UNIT INITIAL IG LOW VOLTAGE; DTC 61-21: VSA MODULATOR-CONTROL UNIT POWER SOURCE LOW VOLTAGE 1; DTC 61-22: VSA MODULATOR-CONTROL UNIT POWER SOURCE LOW VOLTAGE 2; DTC 61-23: VSA MODULATOR-CONTROL UNIT POWER SOURCE LOW VOLTAGE 3

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then start the engine.
4. Check for DTCs with the HDS.

Is DTC 61-01, 61-21, 61-22, or 61-23 indicated?

YES -Go to step 5.

NO -Intermittent failure, the system is OK at this time. Check for loose terminals at the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Check and note BATTERY voltage in the VSA DATA LIST with the H DS. If the voltage listed is 0 V, go to step 8, otherwise go to step 6.
6. Using a voltmeter, measure and note the voltage between the battery terminals.

NOTE: If the voltage is below 9.5 V, check the battery (see BATTERY TEST), and troubleshoot the alternator regulator circuit (see ALTERNATOR AND REGULATOR CIRCUIT TROUBLESHOOTING).

7. Compare the voltage noted in step 5 to the voltage in step 6.

Is the difference between the two voltage readings less then 3 V?

YES -Intermittent failure, the system is OK at this time. Check for loose terminals at the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see). If the code resets after clearing, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

8. Turn the ignition switch to LOCK (0).
9. Disconnect the VSA modulator-control unit 37P connector.
10. Measure voltage between VSA modulator-control unit 37P connector terminal No. 13 and body ground.

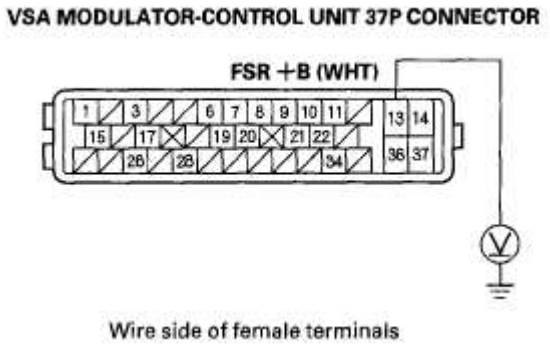


Fig. 36: Measuring Voltage Between VSA Modulator-Control Unit 37P Connector Terminal No. 13 And Body Ground

Is there battery voltage?

YES -Go to step 11.

NO -Repair open in the wire between the No. 3 FSR (40 A) fuse in the under-hood fuse/relay box and the VSA modulator-control unit.

11. Turn the ignition switch ON (II).
12. Measure voltage between VSA modulator-control unit 37P connector terminal No. 28 and body ground.

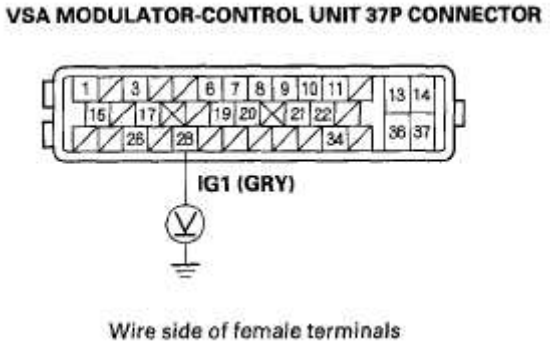


Fig. 37: Measuring Voltage Between VSA Modulator-Control Unit 37P Connector Terminal No. 28 And Body Ground

Is there battery voltage?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit

(see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the No. 4 (7.5 A) fuse in the under-dash fuse/relay box and the VSA modulator-control unit.

DTC 62-21: VSA MODULATOR-CONTROL UNIT IG HIGH VOLTAGE

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then start the engine.
4. Check for DTCs with the HDS.

   Is DTC 62-21 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time.

5. Using a voltmeter, measure the voltage between the battery terminals. Compare the voltage measured at the battery with the voltage shown in the VSA DATA LIST with the HDS.

   Is there a voltage difference of 3 V or more?

   YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

   NO -Check the battery (see **BATTERY TEST**), and troubleshoot the alternator regulator circuit (see **ALTERNATOR AND REGULATOR CIRCUIT TROUBLESHOOTING**). Also check for loose terminals in the VSA modulator-control unit 37P connector. If it is OK, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

DTC 64-11: STEERING ANGLE SENSOR POWER CIRCUIT SHORT

1. Turn the ignition switch ON (II).

2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 64-11 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time.

5. Turn the ignition switch to LOCK (0).
6. Disconnect the steering angle sensor 5P connector.
7. Disconnect the VSA modulator-control unit 37P connector.
8. Check for continuity between steering angle sensor 5P connector terminal No. 5 and body ground.

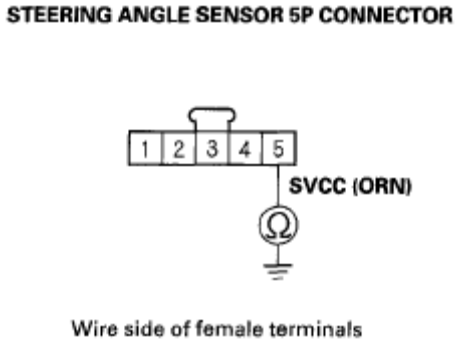


Fig. 38: Checking Continuity Between Steering Angle Sensor 5P Connector Terminal No. 5 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

DTC 64-12: STEERING ANGLE SENSOR POWER CIRCUIT OPEN

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 64-12 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between the steering angle sensor 5P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Disconnect the steering angle sensor 5P connector.
7. Disconnect the VSA modulator-control unit 37P connector.
8. Check for continuity between VSA modulator-control unit 37P connector terminal No. 7 and steering angle sensor 5P connector terminal No. 5.

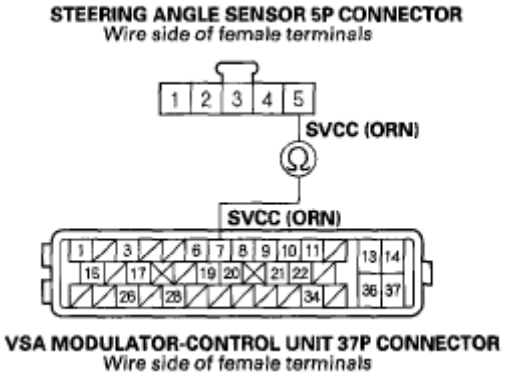

STEERING ANGLE SENSOR 5P CONNECTOR
Wire side of female terminals
1 2 3 4 5
SVCC (ORN)
SVCC (ORN)
VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
Wire side of female terminals

Fig. 39: Checking Continuity Between VSA Modulator-Control Unit 7 And Steering Angle Sensor 5P Connector Terminal No. 5

Is there continuity?

YES -Go to step 9.

NO -Repair open in the wire between the steering angle sensor and the VSA modulator-control unit.

9. Turn the ignition switch ON (II).
10. Measure voltage between steering angle sensor 5P connector terminal No. 5 and body ground.

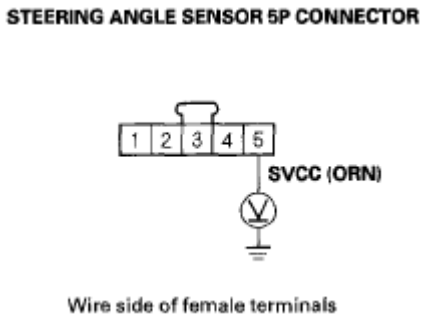


Fig. 40: Measuring Voltage Between Steering Angle Sensor 5P Connector Terminal No. 5 And Body Ground

Is there 0.1 V or more?

YES -Repair short to power in the wire between the steering angle sensor and the VSA modulator-control unit.

NO -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

DTC 65-21: BRAKE FLUID LEVEL STUCK ON

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

Is DTC 65-21 indicated?

YES -Go to step 5.

NO -Intermittent failure, the system is OK at this time.

5. Release the parking brake.
6. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
7. Check the brake system indicator in the gauge control module (tach).

   Does the indicator come on then go off?

   YES -Go to step 8.

   NO -Go to step 9.

8. Check the FLUID LEVEL in the VSA DATA LIST with the HDS while moving the brake fluid reservoir tank float.

   Does it indicate ON when the float is lowered and OFF when the float is raised?

   YES -Intermittent failure, the system is OK at this time.

   NO -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

9. Check the brake fluid level in the master cylinder reservoir tank.

   Is the brake fluid level OK?

   YES -Go to step 10.

   NO -Do the brake pad inspection: Front (see **INSPECTION - SI MODEL**), rear (see **REAR BRAKE PAD INSPECTION AND REPLACEMENT**), check for brake fluid leaks or replace worn pads, then go to step 1 and recheck.

10. Check the FLUID LEVEL in the VSA DATA LIST with the HDS while moving the brake fluid reservoir tank float.

Does it indicate ON when the float is lowered and OFF when the float raised?

YES -Go to step 11.

NO -Replace the brake fluid reservoir tank (brake fluid level switch is included) (see **MASTER CYLINDER INSPECTION**).

11. Turn the ignition switch to LOCK (0).
12. Disconnect the gauge control module (tach) 36P connector.
13. Disconnect the brake fluid level switch 2P connector.
14. Check for continuity between brake fluid level switch 2P connector terminal No. 2 and body ground.

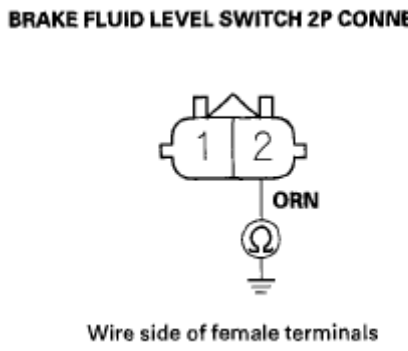


Fig. 41: Checking Continuity Between Brake Fluid Level Switch 2P Connector Terminal No. 2 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the gauge control module (tach) and the brake fluid level switch.

NO -Substitute a known-good gauge control module (tach), then go to step 1 and recheck. If no DTCs are indicated, replace the original gauge control module (tach) (see **REPLACEMENT**).

DTC 66-11: PRESSURE SENSOR (INSIDE OF VSA MODULATOR-CONTROL UNIT) MALFUNCTION; DTC 66-12: PRESSURE SENSOR (INSIDE OF VSA MODULATOR-CONTROL UNIT) MALFUNCTION; DTC 66-13: PRESSURE SENSOR (INSIDE OF VSA MODULATOR-CONTROL UNIT) MALFUNCTION; DTC 66-14: PRESSURE SENSOR (INSIDE OF VSA MODULATOR-CONTROL UNIT) MALFUNCTION; DTC 66-16: PRESSURE SENSOR (INSIDE OF

VSA MODULATOR-CONTROL UNIT) MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 66-11, 66-12, 66-13, 66-14, or 66-16 indicated?

   YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

   NO -Intermittent failure, the system is OK at this time.

DTC 66-15: PRESSURE SENSOR (INSIDE OF VSA MODULATOR-CONTROL UNIT) MALFUNCTION

1. Raise the vehicle, and support it with safety stands in the proper locations (see **LIFT AND SUPPORT POINTS**).
2. Turn all four wheels by hand.

   Is there brake drag?

   YES -Repair the brake drag.

   NO -Go to step 3.

3. Check the PRESSURE SWITCH in the VSA DATA LIST with the HDS while moving the brake pedal.

   Does the indicated value change?

   YES -Intermittent failure, the system is OK at this time.

   NO -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

DTC 68-21: BRAKE PEDAL POSITION SWITCH STUCK OFF

1. Turn the ignition switch ON (II).
2. Check the BRK PRESS in the VSA DATA LIST with the HDS. Do not press the brake pedal.

   Is there 10 MPa or less?

   YES -Go to step 3.

   NO -Check for brake drag or a miss-adjusted brake pedal position switch. If they are normal, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

3. Check the BRAKE SWITCH in the VSA DATA LIST with the HDS while moving the brake pedal.

   Does it indicate ON when the pedal is pressed, and OFF when pedal is released?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the brake pedal position switch 4P connector, ECM connector A (44P), and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 4.

4. Turn the ignition switch to LOCK (0).
5. Disconnect the brake pedal position switch 4P connector.
6. Connect brake pedal position switch 4P connector terminal No. 1 and No. 2 to with a jumper wire.

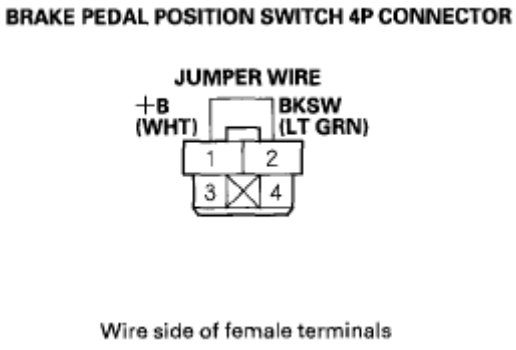


Fig. 42: Identifying Brake Pedal Position Switch 4P Connector Terminal No. 1 And No. 2 To With Jumper Wire

7. Turn the ignition switch ON (II).
8. Check the BRAKE SWITCH in the VSA DATA LIST with the HDS.

   Does it indicate ON?

   YES -Check the brake pedal position switch adjustment (see **BRAKE PEDAL AND BRAKE PEDAL POSITION SWITCH ADJUSTMENT**). If it is OK, replace the brake pedal position switch.

   NO -Go to step 9.

9. Disconnect the jumper wire.
10. Turn the ignition switch to LOCK (0).
11. Short the SCS line with the HDS.
12. Disconnect ECM connector A (44P).
13. Check for continuity between brake pedal position switch 4P connector terminal No. 2 and ECM connector A (44P) terminal No. 40.

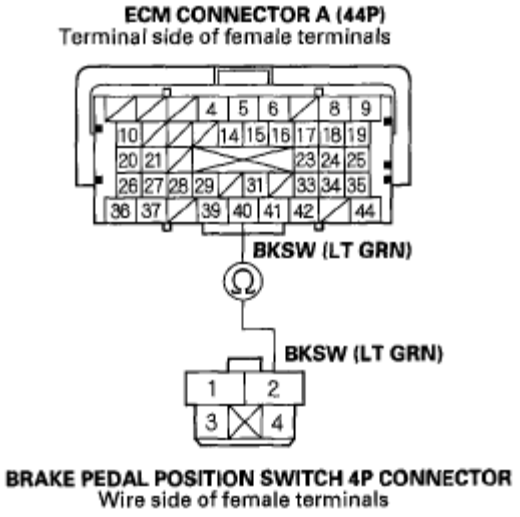

ECM CONNECTOR A (44P)
Terminal side of female terminals
4 5 6 8 9
10 14 15 16 17 18 19
20 21 23 24 25
26 27 28 29 31 33 34 35
36 37 39 40 41 42 44
BKSW (LT GRN)
BKSW (LT GRN)
1 2
3 4
BRAKE PEDAL POSITION SWITCH 4P CONNECTOR
Wire side of female terminals

Fig. 43: Checking Continuity Between Brake Pedal Position Switch 4P Connector And ECM Connector A (44P)

Is there continuity?

YES -Substitute a known-good ECM, then go to step 1 and recheck. If DTCs are not indicated, replace the original ECM (see **ECM REPLACEMENT**).

NO -Repair open in the wire between the ECM and the brake pedal position switch.

DTC 68-22: BRAKE PEDAL POSITION SWITCH STUCK ON

1. Turn the ignition switch ON (II).
2. Check the BRK PRESS in the VSA DATA LIST with the HDS. Do not press the brake pedal.

   Is 10 MPa or more?

   YES -Check brake pedal height (see **BRAKE PEDAL AND BRAKE PEDAL POSITION SWITCH ADJUSTMENT**). If the brake pedal height is OK, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

   NO -Go to step 3.

3. Check the BRAKE SWITCH in the VSA DATA LIST with the HDS while moving the brake pedal.

   Does it indicate ON when the pedal is pressed, and OFF when the pedal is released?

   YES -Intermittent failure, the system is OK at this time.

   NO -Go to step 4.

4. Check the BRAKE SWITCH in the VSA DATA LIST with the HDS, and disconnect the brake pedal position switch 4P connector.

   Does the indicator change from ON to OFF?

   YES -Replace the brake pedal position switch (see **BRAKE PEDAL AND BRAKE PEDAL POSITION SWITCH ADJUSTMENT**).

   NO -Go to step 5.

5. Turn the ignition switch to LOCK (0).
6. Short the SCS line with the HDS.
7. Disconnect ECM connector A (44P).
8. Turn the ignition switch ON (II).
9. Measure voltage between brake pedal position switch 4P connector terminal No. 2 and body ground.

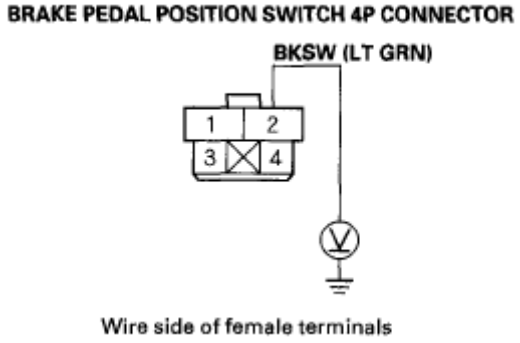


Fig. 44: Measuring Voltage Between Brake Pedal Position Switch 4P

Connector Terminal No. 2 And Body Ground

Is there 0.1 V or more?

YES -Repair short to power in the wire between the ECM and the brake pedal position switch.

NO -Substitute a known-good ECM, then go to step 1 and recheck. If DTCs are not indicated, replace the original ECM (see **ECM REPLACEMENT**).

DTC 71-21: RIGHT-FRONT OR LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-22: LEFT-FRONT OR RIGHT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-23: RIGHT-FRONT AND RIGHT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-24: LEFT-FRONT AND LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-25: RIGHT-FRONT AND LEFT-FRONT DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-26: RIGHT-REAR AND LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-27: RIGHT-FRONT OR LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-28: LEFT-FRONT OR RIGHT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-29: RIGHT-FRONT AND RIGHT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-2A: LEFT-FRONT AND LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-2B: RIGHT-FRONT AND LEFT-FRONT DIFFERENT DIAMETER TIRE MALFUNCTION;
DTC 71-2C: RIGHT-REAR AND LEFT-REAR DIFFERENT DIAMETER TIRE MALFUNCTION

NOTE: The DTC will be indicated when the vehicle has a different diameter tire(s) compared to the other tire(s).

DTC REFERENCE

DTC	Sectional	Note
71-21	Right-front or left-rear	
71-22	Left-front or right-rear	
71-23	Right-front and right-rear	
71-24	Left-front and left-rear	
71-25	Right-front and left-front	
71-26	Right-rear and left-rear	
71-27	Right-front or left-rear	
71-28	Left-front or right-rear	
71-29	Right-front and right-rear	
71-2A	Left-front and left-rear	

71-2B	Right-front and left-front	
71-2C	Right-rear and left-rear	

1. Check the tires for proper inflation (see **WHEEL ALIGNMENT**).
2. Turn the ignition switch ON (II).
3. Clear the DTC with the HDS.
4. Turn the ignition switch to LOCK (0).
5. Test-drive the vehicle.
6. Check for DTCs with the HDS.

   Is DTC 71-21, 71-22, 71-23, 71-24, 71-25, 71-26, 71-27, 71-28, 71-29, 71-2A, 71-2B, or 71-2C indicated?

   YES -Replace all four tires with the proper size (see **WHEEL ALIGNMENT**).

   NO -Intermittent failure, the system is OK at this time.

DTC 81-XX*: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

* : Subcode (Except DTC 81-11,81-3D, 81-3E, 81-51, 81-52,81-53,81-54,81-55, 81-56,81-57,81-58, and 81-59)

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 81-xx indicated?

   YES -If the DTC 81-11,81-3D,81-3E, 81-51, 81-52, 81-53, 81-54, 81-55, 81-56, 81-57,81-58, or 81-59 is indicated at the same time, do the DTC 81-11, 81-52,81-54,81-56, or 81-58 troubleshooting (see **DTC 81-xx*: Central Processing Unit (CPU) Internal Circuit Malfunction**), DTC 81-51,81-53,81-55, or 81-57 troubleshooting (see **DTC 81-51: Central Processing Unit (CPU) Internal Circuit Malfunction; DTC 81-53: Central Processing Unit**

(CPU) Internal Circuit Malfunction; DTC 81-55: Central Processing Unit (CPU) Internal Circuit Malfunction; DTC 81-57: Central Processing Unit (CPU) Internal Circuit Malfunction), or DTC 81-3D, 81-3E, or 81-59 troubleshooting (see **DTC 81-3D: Central Processing Unit (CPU) Internal Circuit Malfunction; DTC 81-3E: Central Processing Unit (CPU) Internal Circuit Malfunction; DTC 81-59: Central Processing Unit (CPU) Internal Circuit Malfunction**). If DTC 81-11, 81-3D, 81-3E, 81-51, 81-52, 81-53, 81-54, 81-55, 81-56, 81-57, 81-58, or 81-59 is not indicated. Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 81-11: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-52: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-54: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-56: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-58: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle.
4. Check for DTCs with the HDS.

Is DTC 81-11, 81-52, 81-54, 81-56, or 81-58 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 81-51: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-53: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-55: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-57: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.

3. Test-drive the vehicle.
4. Check for DTCs with the HDS.

   Is DTC 81-51, 81-53, 81-55, or 81-57 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time.

5. Turn the ignition switch to LOCK (0).
6. Disconnect the VSA modulator-control unit 37P connector.
7. Turn the ignition switch ON (II).
8. Measure voltage between body ground and the appropriate VSA modulator-control unit 37P connector terminals (see table).

DTC REFERENCE

DTC	VSA Modulator-control Unit 37P Connector Terminals No.
81-51	No. 19
81-53	No. 22
81-55	No. 9
81-57	No. 20

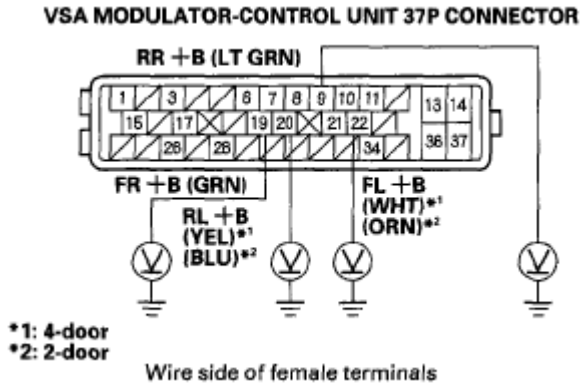


Fig. 45: Measuring Voltage Between Body Ground And Appropriate VSA Modulator-Control Unit 37P Connector Terminals

Is there 0.1 V or more?

YES -Repair short to power in the wire between the appropriate wheel speed sensor and the VSA modulator-control unit.

NO -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

DTC 81-3D: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-3E: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION; DTC 81-59: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Turn the steering wheel from lock to lock.
5. Check for DTCs with the HDS.

Is DTC 81-3D, 81-3E, or 81-59 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

DTC 83-13: ECM COMMUNICATION ERROR; DTC 83-14: ECM COMMUNICATION ERROR

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle.
4. Check for DTCs with the HDS.

Is DTC 83-13, or 83-14 indicated?

YES -Go to step 5.

NO -Intermittent failure, the system is OK at this time. Check for loose terminals between ECM connector A (44P) and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES**

TROUBLESHOOTING (see).

5. Turn the ignition switch to LOCK (0).
6. Substitute a known-good ECM (see **SUBSTITUTING THE ECM**).
7. Turn the ignition switch ON (II).
8. Clear the DTC with the HDS.
9. Test-drive the vehicle.
10. Check for DTCs with the HDS.

Is DTC 83-13, 83-14 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Replace the original ECM (see **ECM REPLACEMENT**).

DTC 84-21: VSA SENSOR NEUTRAL POSITION NOT WRITING

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
5. Check for DTCs with the HDS.

Is DTC 84-21 indicated?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -The system is OK at this time.

DTC 86-01: F-CAN BUS-OFF MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

   Is DTC 86-01 indicated?

   YES -Go to step 5.

   NO -Intermittent failure, the system is OK at this time. Check for loose terminals between ECM connector A (44P) and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch to LOCK (0).
6. Short the SCS line with the HDS.
7. Disconnect ECM connector A (44P).
8. Disconnect the HDS from the data link connector (DLC).
9. Disconnect the gauge control module (tach) 36P connector.
10. Disconnect SRS unit connector A (28P).
11. With EPS: Disconnect EPS control unit connector D (28P).
12. With TPMS: Disconnect the TPMS control unit 20P connector.
13. Disconnect the yaw rate-lateral acceleration sensor 5P connector.
14. Disconnect the VSA modulator-control unit 37P connector.
15. Check for continuity between VSA modulator-control unit 37P connector terminals No. 1 and No. 15 and body ground individually.

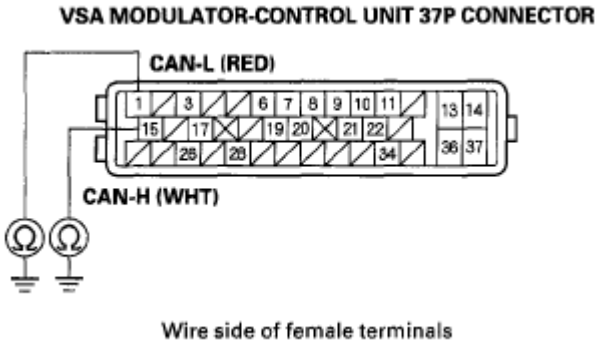


Fig. 46: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminals No. 1 And No. 15 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the ECM/PCM, the gauge control module (tach), the data link connector (DLC), the SRS unit, the EPS control unit (if equipped), the TPMS control unit (if equipped), and the yaw rate-lateral acceleration sensor, and the VSA modulator-control unit.

NO -Go to step 16.

16. Check for continuity between VSA modulator-control unit 37P connector terminals No. 1 and No. 15.

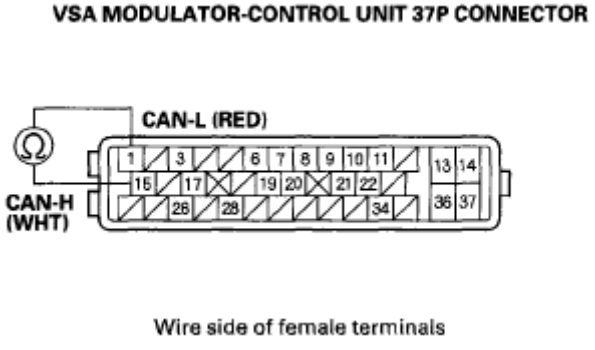


Fig. 47: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminals No. 1 And No. 15

Is there continuity?

YES -Repair short in the wire between VSA modulator-control unit 37P

connector terminals No. 1 (CAN-L line) and No. 15 (CAN-H line).

NO -Go to step 17.

17. Check for continuity between the VSA modulator-control unit 37P connector terminal and ECM connector A (44P) terminal (see table).

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	ECM
CAN-L	1	37
CAN-H	15	36

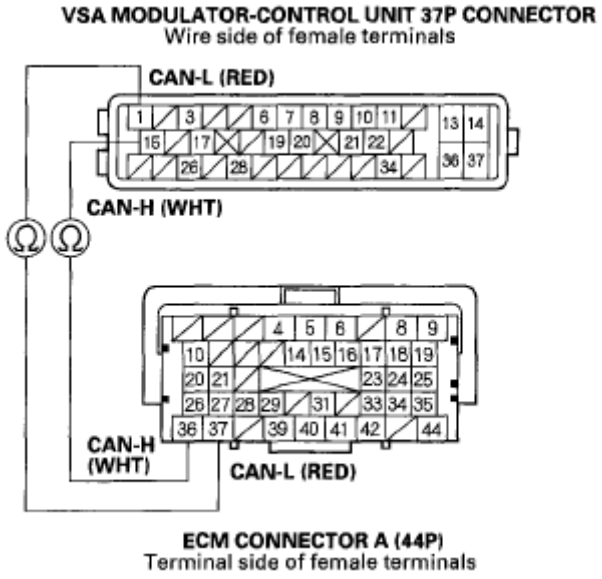


Fig. 48: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminal And ECM Connector A (44P) Terminal

Is there continuity?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the ECM and the VSA modulator-

control unit.

DTC 86-11: F-CAN COMMUNICATION WITH ECM MALFUNCTION; DTC 86-21: F-CAN COMMUNICATION WITH ENGINE MALFUNCTION; DTC 86-22: F-CAN COMMUNICATION WITH ENGINE MALFUNCTION; DTC 86-23: F-CAN COMMUNICATION WITH ENGINE MALFUNCTION; DTC 86-24: F-CAN COMMUNICATION WITH ENGINE MALFUNCTION; DTC 86-25: F-CAN COMMUNICATION WITH ENGINE MALFUNCTION; DTC 86-41: F-CAN COMMUNICATION WITH EAT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0).
4. Test-drive the vehicle. Drive the vehicle at 7 mph (10 km/h) or more.
5. Check for DTCs with the HDS.

   Is 86-11, 86-21, 86-22, 86-23, 86-24, 86-25, and/or 86-41 DTC indicated?

   YES -If the DTC 86-01 is indicated at the same time, do the DTC 86-01 troubleshooting (see **DTC 86-01: F-CAN Bus-off Malfunction**). If 86-01 is not indicated, go to step 6.

   NO -If any DTCs are indicated, go to the indicated DTCs troubleshooting. If DTCs are not indicated, intermittent failure, the system is OK at this time. Check for loose terminals between ECM connector A (44P) and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

6. Turn the ignition switch to LOCK (0).
7. Short the SCS line with the HDS.
8. Disconnect ECM connector A (44P).
9. Disconnect the VSA modulator-control unit 37P connector.
10. Check for continuity between the VSA modulator-control unit 37P connector terminal and ECM connector A (44P) terminal (see table).

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	

	VSA Modulator-control Unit	ECM
CAN-L	1	37
CAN-H	15	36

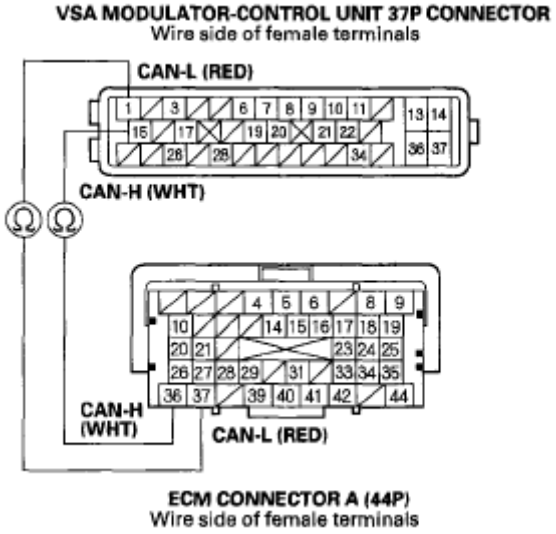


Fig. 49: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminal And ECM Connector A (44P) Terminal

Is there continuity?

YES -Check for loose terminals in ECM connector A (44P) and at the VSA modulator-control unit 37P connector. If necessary, substitute a known-good ECM, then go to step 1 and recheck. If no DTCs are indicated, replace the original ECM (see **ECM REPLACEMENT**). If DTCs are indicated, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Repair open in the wire between the ECM and the VSA modulator-control unit.

DTC 86-31: F-CAN COMMUNICATION WITH GAUGE CONTROL MODULE MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.

4. Check for DTCs with the HDS.

   Is 86-31 DTC indicated?

   YES -If the DTC 86-01 is indicated at the same time, do the DTC 86-01 troubleshooting (see **DTC 86-01: F-CAN Bus-off Malfunction**). If 86-01 is not indicated, go to step 5.

   NO -If any DTCs are indicated, go to the indicated DTCs troubleshooting. If DTCs are not indicated, intermittent failure, the system is OK at this time. Check for loose terminals between the gauge control module (tach) 36P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

5. Turn the ignition switch ON (II).

   Do the gauge indicators come on?

   YES -Go to step 6.

   NO -Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**).

6. Turn the ignition switch to LOCK (0).
7. Disconnect the gauge control module (tach) 36P connector.
8. Disconnect the VSA modulator-control unit 37P connector.
9. Check for continuity between the VSA modulator-control unit 37P connector terminal and gauge control module (tach) 36P connector terminal (see table).

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	Gauge Control Module (Tach)
CAN-L	1	19
CAN-H	15	1

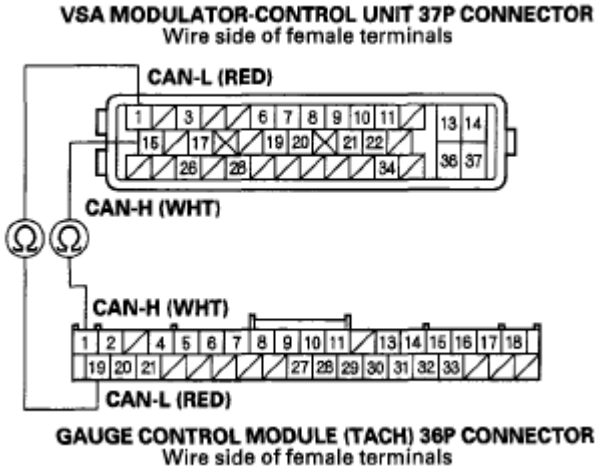


Fig. 50: Checking Continuity Between VSA Modulator-Control Unit And Gauge Control Module 36P Connector Terminal

Is there continuity?

YES -Check for loose terminals in the gauge control module (tach) 36P connector. If necessary, substitute a known-good gauge control module (tach), then go to step 1 and recheck. If no DTCs are indicated, replace the original gauge control module (tach) (see **REPLACEMENT**). If DTC 86-31 resets, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Repair open in the wire between the gauge control module (tach) and the VSA modulator-control unit.

DTC 86-71: F-CAN COMMUNICATION WITH YAW RATE-LATERAL ACCELERATION SENSOR MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Check for DTCs with the HDS.

Is 86-71 DTC indicated?

YES -If the DTC 86-01 is indicated at the same time, do the DTC 86-01 troubleshooting (see **DTC 86-01: F-CAN Bus-off Malfunction**). If 86-01 is

not indicated, go to step 4.

NO -If any DTCs are indicated, go to the indicated DTCs troubleshooting. If DTCs are not indicated, intermittent failure, the system is OK at this time. Check for loose terminals at the yaw rate-lateral acceleration sensor 5P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

4. Turn the ignition switch to LOCK (0).
5. Disconnect the yaw rate-lateral acceleration sensor 5P connector.
6. Disconnect the VSA modulator-control unit 37P connector.
7. Check for continuity between the VSA modulator-control unit 37P connector terminal and the yaw rate-lateral acceleration sensor 5P connector terminal (see table).

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	Yaw Rate-lateral Acceleration Sensor
CAN-L	1	4
CAN-H	15	3

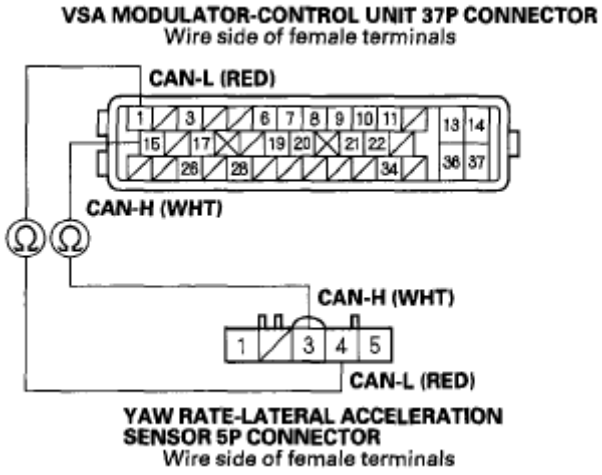

VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
Wire side of female terminals
CAN-L (RED)
1 3 6 7 8 9 10 11 13 14
15 17 19 20 21 22 36 37
26 28 34
CAN-H (WHT)
CAN-H (WHT)
1 3 4 5
CAN-L (RED)
YAW RATE-LATERAL ACCELERATION SENSOR 5P CONNECTOR
Wire side of female terminals

Fig. 51: Checking Continuity Between VSA Modulator-Control Unit And

YAW Rate-Lateral Acceleration Sensor 5P Connector Terminal

Is there continuity?

YES -Go to step 8.

NO -Repair open in the wire between the yaw rate-lateral acceleration sensor and the VSA modulator-control unit.

8. Turn the ignition switch ON (II).
9. Measure voltage between yaw rate-lateral acceleration sensor 5P connector terminal No. 1 and body ground.

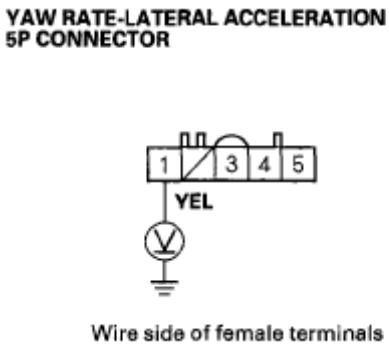


Fig. 52: Measuring Voltage Between YAW Rate-Lateral Acceleration Sensor 5P Connector Terminal And Body Ground

Is there battery voltage?

YES -Go to step 10.

NO -Check the No. 4 (7.5 A) fuse in the under-dash fuse/relay box. If the fuse is OK, repair open in the wire between the No. 4 (7.5 A) fuse and yaw rate-lateral acceleration sensor.

10. Turn the ignition switch to LOCK (0).
11. Reconnect the yaw rate-lateral acceleration sensor 5P connector.
12. Turn the ignition switch ON (II).
13. Measure voltage between yaw rate-lateral acceleration sensor 5P connector terminal No. 5 and body ground.

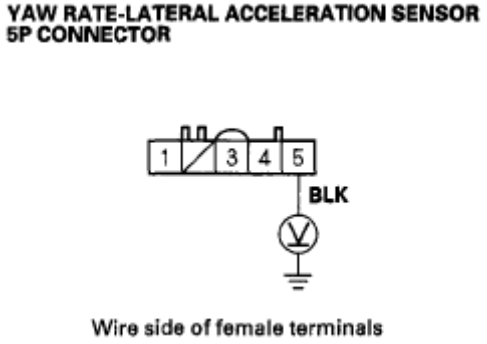


Fig. 53: Measuring Voltage Between YAW Rate-Lateral Acceleration Sensor 5P Connector Terminal And Body Ground

Is there 0.1 V or less?

YES -Replace the yaw rate-lateral acceleration sensor (see **YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT**).

NO -Repair open in the wire between the yaw rate-lateral acceleration sensor and body ground (G602).

DTC 107-22: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

1. Turn the ignition switch to LOCK (0) to cool the VSA modulator-control unit, and wait 1 hour or more.
2. Turn the ignition switch ON (II).
3. Clear the DTC with the HDS.
4. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
5. Check for DTCs with the HDS.

Is DTC 107-22 indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -The system is OK at this time.

DTC 108-21: STEERING ANGLE SENSOR MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
4. Test-drive the vehicle.
5. Check for DTCs with the HDS.

   Is DTC 108-21 indicated?

   YES -Go to step 6.

   NO -Intermittent failure, the system is OK at this time.

6. Turn the ignition switch to LOCK (0).
7. Substitute a known-good steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).
8. Turn the ignition switch ON (II).
9. Clear the DTC with the HDS.
10. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
11. Test-drive the vehicle.
12. Check for DTCs with the HDS.

    Is DTC 108-21 indicated?

    YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

    NO -Replace the original steering angle sensor (see **STEERING ANGLE SENSOR REPLACEMENT**).

DTC 112-01: CENTRAL PROCESSING UNIT (CPU) INTERNAL CIRCUIT MALFUNCTION

1. Turn the ignition switch ON (II).
2. Clear the DTC with the HDS.

3. Turn the ignition switch to LOCK (0).
4. Disconnect the VSA modulator-control unit 37P connector.
5. Measure voltage between VSA modulator-control unit 37P connector terminal No. 13 and body ground.

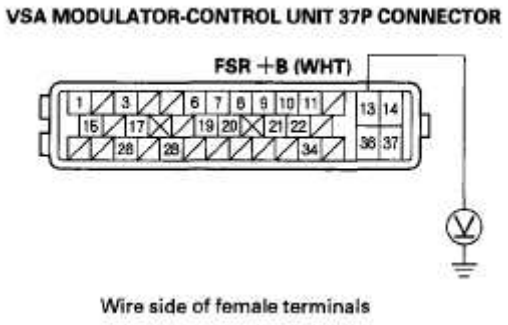

VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
FSR +B (WHT)
1 3 6 7 8 9 10 11 13 14
15 17 19 20 21 22 36 37
26 28 34
Wire side of female terminals

Fig. 54: Measuring Voltage Between VSA Modulator-Control Unit 37P Connector Terminal No. 13 And Body Ground

Is there battery voltage?

YES -Go to step 6.

NO -Check the battery performance (see **BATTERY TEST**), and troubleshoot the alternator and regulator circuit (see **ALTERNATOR AND REGULATOR CIRCUIT TROUBLESHOOTING**).

6. Measure voltage between VSA modulator-control unit 37P connector terminal No. 28 and body ground.

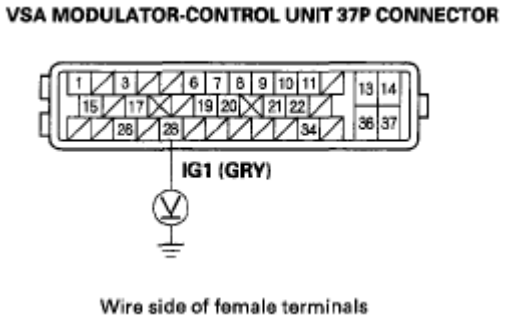

VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
1 3 6 7 8 9 10 11 13 14
15 17 19 20 21 22 36 37
26 28 34
IG1 (GRY)
Wire side of female terminals

Fig. 55: Measuring Voltage Between VSA Modulator-Control Unit 37P Connector Terminal No. 28 And Body Ground

Is there 0 V?

YES -Go to step 7.

NO -Repair short to power in the wire between the No. 4 (7.5 A) fuse in the under-dash fuse-relay box and the VSA modulator-control unit.

7. Turn the ignition switch ON (II).
8. Measure voltage between VSA modulator-control unit 37P connector terminal No. 28 and body ground.

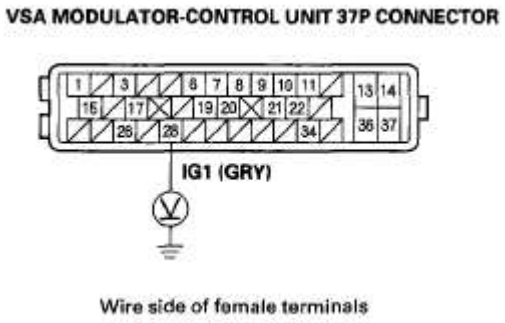

VSA MODULATOR-CONTROL UNIT 37P CONNECTOR
1 3 8 7 8 9 10 11 13 14
15 17 19 20 21 22 36 37
26 28 34
IG1 (GRY)
V
Wire side of female terminals

Fig. 56: Measuring Voltage Between VSA Modulator-Control Unit 37P Connector Terminal No. 28 And Body Ground

Is there battery voltage?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the No. 4 (7.5 A) fuse in the under-dash fuse-relay box and the VSA modulator-control unit.

DTC 121-XX*: VSA SOLENOID VALVE MALFUNCTION; DTC 122-XX*: VSA SOLENOID VALVE MALFUNCTION; DTC 123-XX*: VSA SOLENOID VALVE MALFUNCTION; DTC 124-XX*: VSA SOLENOID VALVE MALFUNCTION

*: Subcode

1. Turn the ignition switch ON (II).

2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it ON (II) again.
4. Check for DTCs with the HDS.

CONNECTOR TERMINAL DESCRIPTION

DTC		Sectional	Valve
121	-01	Right-front and left-rear	Regulator
	-02		
	-11		
	-21		
	-24		
122	-01		Suction
	-21		
	-22		
	-23		
123	-01	Left-front and right-rear	Regulator
	-02		
	-11		
	-21		
	-24		
124	-01		Suction
	-21		
	-22		
	-23		

Is DTC 121-xx, 122-xx, 123-xx, or 124-xx indicated?

YES -Replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Intermittent failure, the system is OK at this time.

SYMPTOM TROUBLESHOOTING

ABS indicator or VSA indicator does not go off, and no DTCs are stored

1. Check for the communication between the vehicle and the HDS.

   Is there the communication?

   YES -Check for loose terminals in the gauge control module (tach) 36P connector. If necessary, substitute a known-good gauge control module (tach), then recheck. If it is OK, replace the original gauge control module (tach) (see **REPLACEMENT**).

   NO -If the HDS does not communicate with all the system of the vehicle, troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**). If the HDS does not communicate with only VSA, go to step 2.

2. Turn the ignition switch to LOCK (0).
3. Check the No. 4 (7.5 A) fuse in the under-dash fuse/ relay box.

   Is the fuse blown?

   YES -Install the new No. 4 (7.5 A) fuse, and recheck. If the fuse continues to blow, check for short to body ground in the wire between the No. 4 (7.5 A) fuse in the under-dash fuse/relay box and the VSA modulator-control unit. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

   NO -Reinstall the checked fuse, then go to step 4.

4. Disconnect the VSA modulator-control unit 37P connector.
5. Turn the ignition switch ON (II).
6. Measure voltage between VSA modulator-control unit 37P terminal No. 28 and body ground.

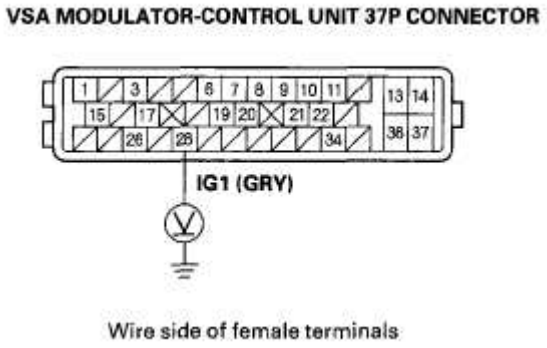


Fig. 57: Measuring Voltage Between VSA Modulator-Control Unit 37P Terminal No. 28 And Body Ground

Is there battery voltage?

YES -Go to step 7.

NO -Repair open in the wire between the No. 4 (7.5 A) fuse in the under-dash fuse/relay box and the VSA modulator-control unit.

7. Turn the ignition switch to LOCK (0).
8. Check for continuity between VSA modulator-control unit 37P terminal No. 36 and body ground.

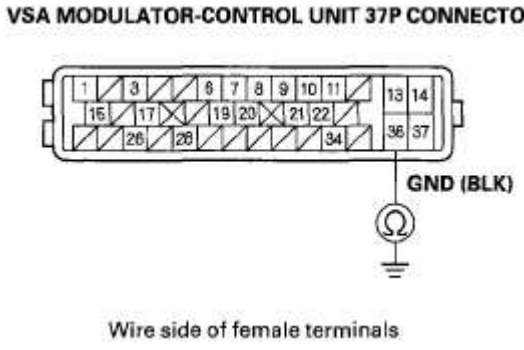


Fig. 58: Checking Continuity Between VSA Modulator-Control Unit 37P Terminal No. 36 And Body Ground

Is there continuity?

YES -Check for loose terminals in the VSA modulator-control unit 37P connector, clean terminal G202 and recheck. If necessary, substitute a known-

good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

NO -Repair open in the wire between the VSA modulator-control unit and body ground (G202).

BRAKE SYSTEM INDICATOR DOES NOT GO OFF, AND NO DTCS ARE STORED

1. Release the parking brake.
2. Turn the ignition switch ON (II).
3. Check the brake system indicator for several seconds when the ignition switch is turned ON (II).

   Does the indicator come on then go off?

   YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the gauge control module (tach) 36P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

   NO -Go to step 4.

4. Check the BRAKE INDICATOR in the VSA DATA LIST with the HDS.

   Does it indicate OFF?

   YES -Go to step 5.

   NO -Check for loose terminals in the VSA modulator-control unit 37P connector. If necessary, substitute a known-good VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**), and retest.

5. Turn the ignition switch to LOCK (0).
6. Disconnect the parking brake switch 1P connector.
7. Turn the ignition switch ON (II).

Does the brake system indicator go off?

YES -Replace the parking brake switch (see **PARKING BRAKE CABLE REPLACEMENT**).

NO -Go to step 8.

8. Turn the ignition switch to LOCK (0).
9. Disconnect the gauge control module (tach) 36P connector.
10. Check for continuity between parking brake switch 1P connector terminal No. 1 and body ground.

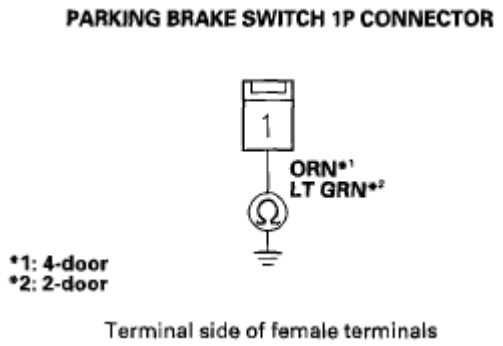


Fig. 59: Checking Continuity Between Parking Brake Switch 1P Connector Terminal No. 1 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the gauge control module (tach) and the parking brake switch.

NO -Check for loose terminals in the gauge control module (tach) 36P connector. If necessary, substitute a known-good gauge control module (tach), then go to step 1 and recheck. If it is OK, replace the original gauge control module (tach) (see **REPLACEMENT**).

VSA activation indicator does not go off, and no DTCs are stored

1. Turn the ignition switch ON (II).
2. Check the VSA activation indicator for several seconds when the ignition

switch is turned ON (II).

Does the indicator come on then go off?

YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the VSA OFF switch 5P connector, the gauge control module (tach) 36P connector, and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT FAILURES TROUBLESHOOTING** (see).

NO -Go to step 3.

3. Check the VSA OFF SWITCH in the VSA DATA LIST with the HDS while pushing the VSA OFF switch.

   Does the indicator change from ON (OFF) to OFF (ON)?

   YES -Do the gauge control module troubleshooting (see **SELF-DIAGNOSTIC FUNCTION**).

   NO -Go to step 4.

4. Turn the ignition switch to LOCK (0).
5. Check the VSA OFF switch (see **VSA OFF SWITCH TEST**).

   Is the VSA off switch OK?

   YES -Go to step 6.

   NO -Replace the VSA OFF switch (see **VSA OFF SWITCH TEST**).

6. Disconnect the gauge control module (tach) 36P connector.
7. Disconnect the VSA OFF switch 5P connector.
8. Check for continuity between VSA OFF switch 5P connector terminal No. 2 and body ground.

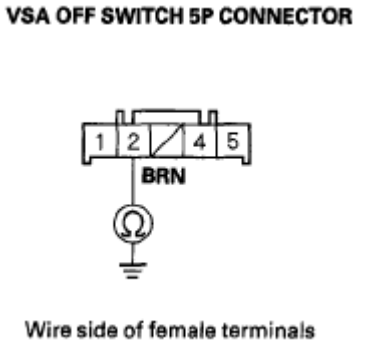


Fig. 60: Checking Continuity Between VSA Off Switch 5P Connector Terminal No. 2 And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the gauge control module (tach) and the VSA OFF switch.

NO -Substitute a known-good VSA modulator-control unit, then go to step 1 and recheck. If it is OK, replace the original VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

ABS indicator, brake system indicator, and VSA indicator do not go off at same time

NOTE: Check for gauge DTCs with the HDS (see WIRE COLOR CODES). If goluges DTCs are stored, troubleshoot those DTCs first.

1. Release the parking brake.
2. Turn the ignition switch ON (II).
3. Check the ABS indicator, brake system indicator and the VSA indicator for several seconds when the ignition switch is turned ON (II).

Do the indicators come on then go off?

YES -Intermittent failure, the system is OK at this time. Check for loose terminals between the gauge control module (tach) 36P connector and the VSA modulator-control unit 37P connector. Refer to **INTERMITTENT**

FAILURES TROUBLESHOOTING (see).

NO -Go to step 4.

4. Turn the ignition switch to LOCK (0).
5. Short the SCS line with the HDS.
6. Disconnect ECM connector A (44P).
7. Disconnect the HDS from the data link connector (DLC).
8. Disconnect the gauge control module (tach) 36P connector.
9. Disconnect SRS unit connector A (28P).
10. Disconnect EPS control unit connector D (28P).
11. With TPMS: Disconnect the TPMS control unit 20P connector.
12. Disconnect the yaw rate-lateral acceleration sensor 5P connector.
13. Disconnect the VSA modulator-control unit 37P connector.
14. Check for continuity between VSA modulator-control unit 37P connector terminals No. 1 and No. 15 and body ground individually.

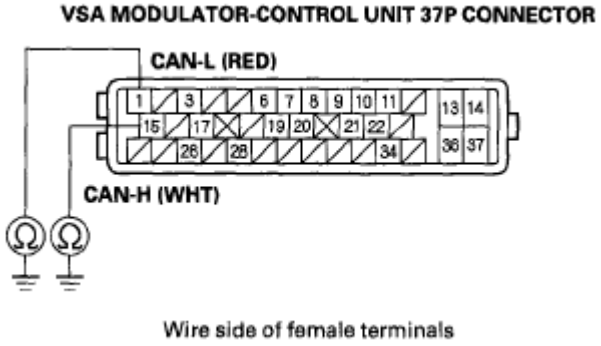


Fig. 61: Checking Continuity Between VSA Modulator-Control Unit And Body Ground

Is there continuity?

YES -Repair short to body ground in the wire between the ECM/PCM, the gauge control module (tach), the data link connector (DLC), the SRS unit, the EPS control unit (if equipped), the TPMS control unit (if equipped), and the yaw rate-lateral acceleration sensor, and the VSA modulator-control unit.

NO -Go to step 15.

15. Check for continuity between VSA modulator-control unit 37P connector terminals No. 1 and No. 15.

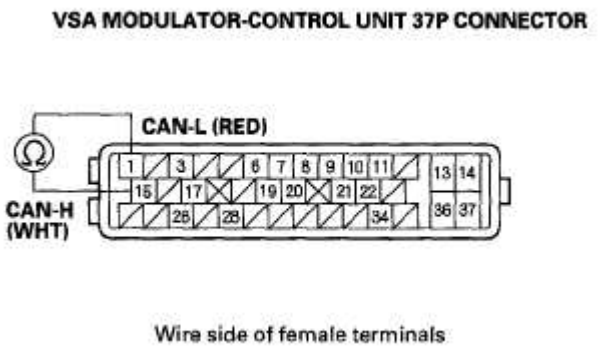


Fig. 62: Checking Continuity Between VSA Modulator-Control Unit 37P Connector Terminals No. 1 And No. 15

Is there continuity?

YES -Repair short in the wire between VSA modulator-control unit 37P connector terminals No. 1 (CAN-L line) and No. 15 (CAN-H line).

NO -Go to step 16.

16. Check for continuity between VSA modulator-control unit 37P connector terminal and gauge control module (tach) 36P connector terminal (see table).

CONNECTOR TERMINAL DESCRIPTION

Sign	Connector Terminal No.	
	VSA Modulator-control Unit	Gauge Control Module (Tach)
CAN-L	1	19
CAN-H	15	1

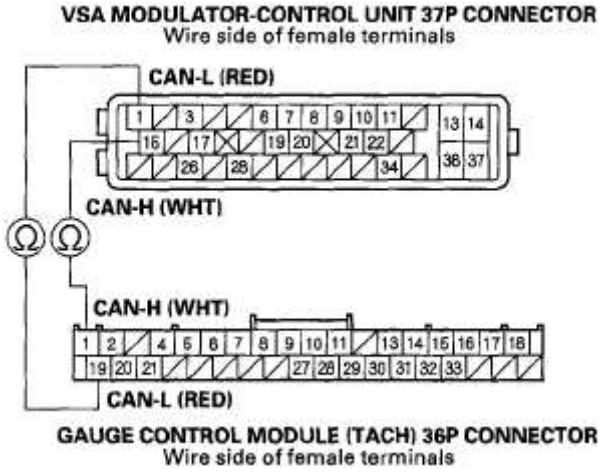


Fig. 63: Checking Continuity Between VSA Modulator-Control Unit And Gauge Control Module Connector Terminal

Is there continuity?

YES -Check for loose terminals in the gauge control module (tach) 36P connector. If necessary, substitute a known-good gauge control module (tach), then go to step 1 and recheck. If it is OK, replace the original gauge control module (tach) (see **REPLACEMENT**). If DTCs are indicated, replace the VSA modulator-control unit (see **VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION**).

NO -Repair open in the wire between the gauge control module (tach) and the VSA modulator-control unit.

STEERING ANGLE SENSOR REPLACEMENT

NOTE: Do not damage or drop the combination switch as the steering angle sensor is sensitive to shock and vibration.

1. Remove the steering wheel (see **STEERING WHEEL REMOVAL**).
2. Remove the steering column covers and the cable reel (see **CABLE REEL REPLACEMENT**).
3. Remove the combination switch assembly (see **STEERING COLUMN REMOVAL AND INSTALLATION**).

4. Remove the combination light switch (A) and the wiper/washer switch (B).

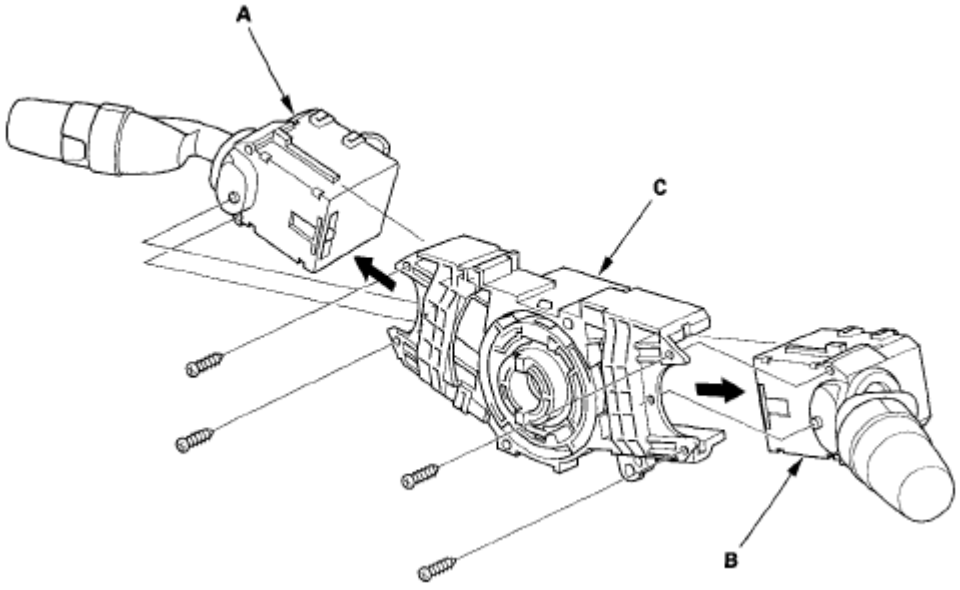


Fig. 64: Identifying Steering Angle Sensor

5. Replace the combination switch (C).
6. Install the combination switch in the reverse order of removal.

NOTE:

- **Do not remove the steering angle sensor from the combination switch body.**
- **When install the cable reel, set the turn signal cancelling sleeve position (see INSTALLATION).**

YAW RATE-LATERAL ACCELERATION SENSOR REPLACEMENT

NOTE:

- **Do not damage or drop the sensor as it is sensitive.**
- **Do not use an air or electric impact tool.**

1. Remove the center console (see **CENTER CONSOLE REMOVAL/INSTALLATION**).
2. Remove the yaw rate-lateral acceleration sensor (A) fixing bolts.

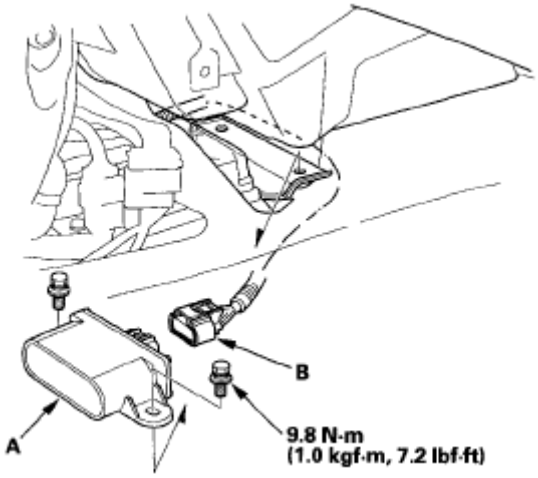


Fig. 65: Identifying YAW Rate-Lateral Acceleration Sensor Fixing Bolts

3. Pull out the yaw rate-lateral acceleration sensor, then disconnect the sensor connector (B).
4. Install the sensor in the reverse order of removal.
5. Do the VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).

VSA SENSOR NEUTRAL POSITION MEMORIZATION

NOTE: Do not press the brake pedal during this procedure.

1. Park the vehicle on a flat and level surface.
2. With the ignition switch to LOCK (0), connect the HDS to the data link connector (DLC) (A) under the driver's side of the dashboard.

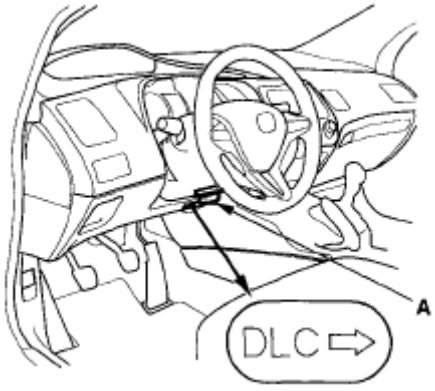


Fig. 66: Identifying DLC

3. Turn the ignition switch ON (II).
4. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't troubleshoot the DLC circuit (see **DLC CIRCUIT TROUBLESHOOTING**).
5. Select VSA ADJUSTMENT with the HDS, and follow the screen prompts.

NOTE: See the HDS Help menu for specific instructions.

6. Turn the ignition switch to LOCK (0).

VSA OFF SWITCH TEST

1. Remove the driver's dashboard lower cover (see **DRIVER's DASHBOARD LOWER COVER REMOVAL/INSTALLATION**).
2. Push out the VSA OFF switch (A) from the back of the instrument panel.

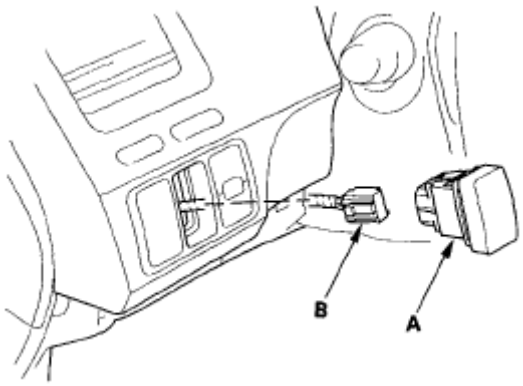


Fig. 67: Identifying VSA Off Switch (A) From Back Of Instrument Panel

3. Disconnect the VSA OFF switch 5P connector (B).
4. Check for continuity between VSA OFF switch 5P connector terminals No. 1 and No. 2. There should be continuity when the switch is pressed, and no continuity when the switch is released.

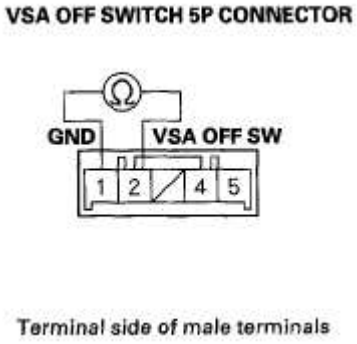


Fig. 68: Checking Continuity Between VSA Off Switch 5P Connector Terminals No. 1 And Switch

5. Check for continuity between VSA OFF switch 5P connector terminals No. 4 and No. 5. There should be continuity at all times.

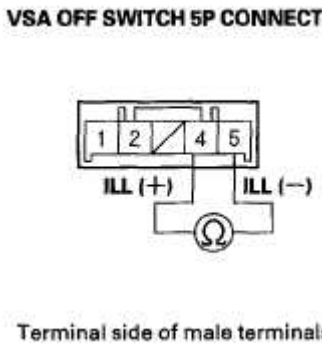


Fig. 69: Checking Continuity Between VSA Off Switch 5P Connector Terminals No. 4 And No. 5

VSA MODULATOR-CONTROL UNIT REMOVAL AND INSTALLATION

NOTE:

- **Do not spill brake fluid on the vehicle; it may damage the paint; if brake fluid gets on the paint, wash it off immediately with water.**
- **Be careful not to damage or deform the brake lines during removal and installation.**
- **To prevent the brake fluid from flowing, plug and cover the hose ends and joints with a shop towel or equivalent material.**

Removal

1. Disconnect the VSA modulator-control unit 37P connector (A) by pushing the lock (B) and pulling down the lever (C); the connector disconnects it self.

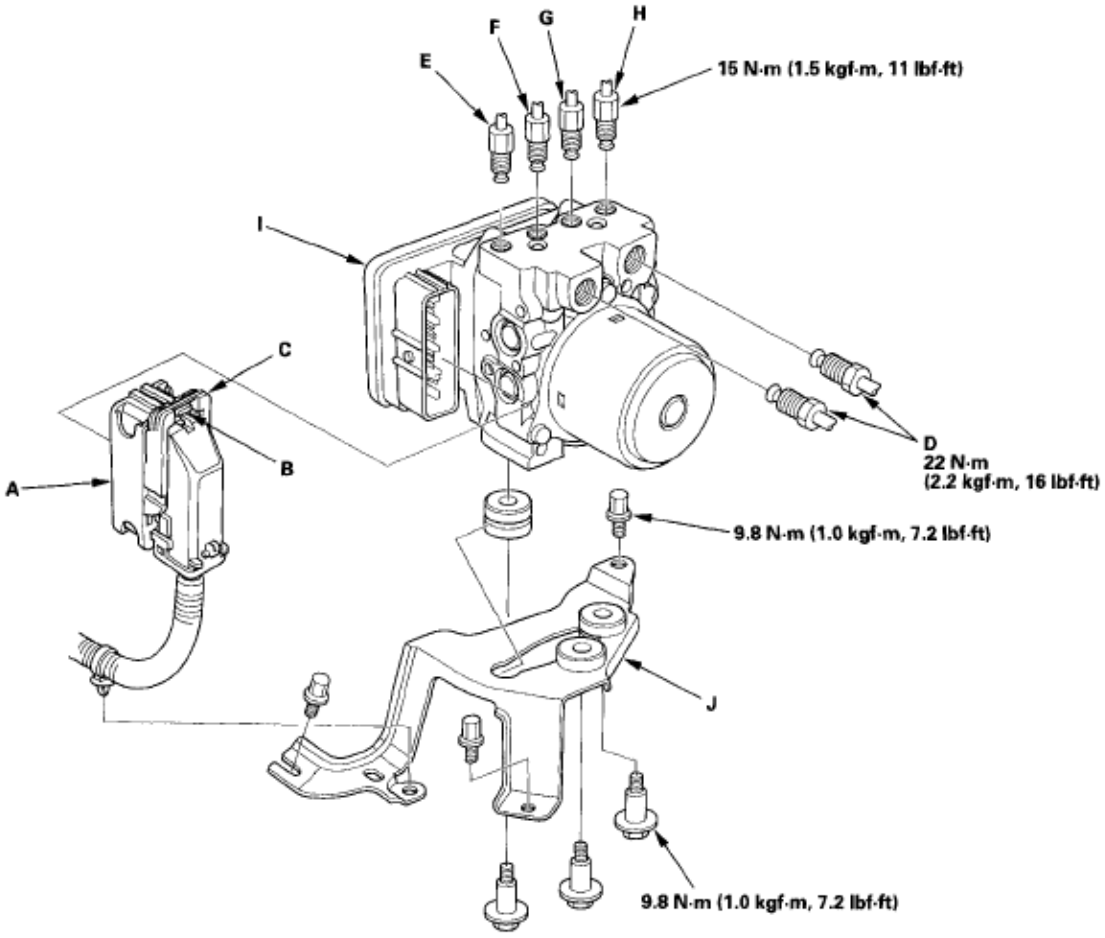


Fig. 70: Identifying VSA Modulator-Control Unit Components (With Torque Specifications)

2. Disconnect the six brake lines from the VSA modulator-control unit.

NOTE: Brake lines are connected to the master cylinder (D) and to the right-front (E), the left-rear (F), the right-rear (G), and the left-front (H) brake systems.

3. Remove the VSA modulator-control unit (I) with the bracket (J) from the body.
4. Remove the VSA modulator-control unit from the bracket.

Installation

1. Install the VSA modulator-control unit on the bracket.
2. Install the bracket with the VSA modulator-control unit to body.
3. Reconnect the six brake lines, then tighten the flare nuts to the specified torque.
4. Align the connecting surface of the VSA modulator-control unit 37P connector to the VSA modulator-control unit.
5. Pull up the lever of the VSA modulator-control unit 37P connector, then confirm the connector is fully seated.
6. Bleed the brake system (see **BRAKE SYSTEM BLEEDING**).
7. Perform VSA sensor neutral position memorization (see **VSA SENSOR NEUTRAL POSITION MEMORIZATION**).
8. Start the engine, and check that the ABS and the VSA indicators go off.
9. Test-drive the vehicle, and check that the ABS, and the VSA indicators do not come on.

NOTE: If the brake pedal is spongy, there may be air trapped in the modulator and then induced into the normal brake system during modulation. Bleed the brake system again (see BRAKE SYSTEM BLEEDING).

WHEEL SPEED SENSOR REPLACEMENT

FRONT

1. Release the clamp (A), then disconnect the wheel speed sensor connector (B).

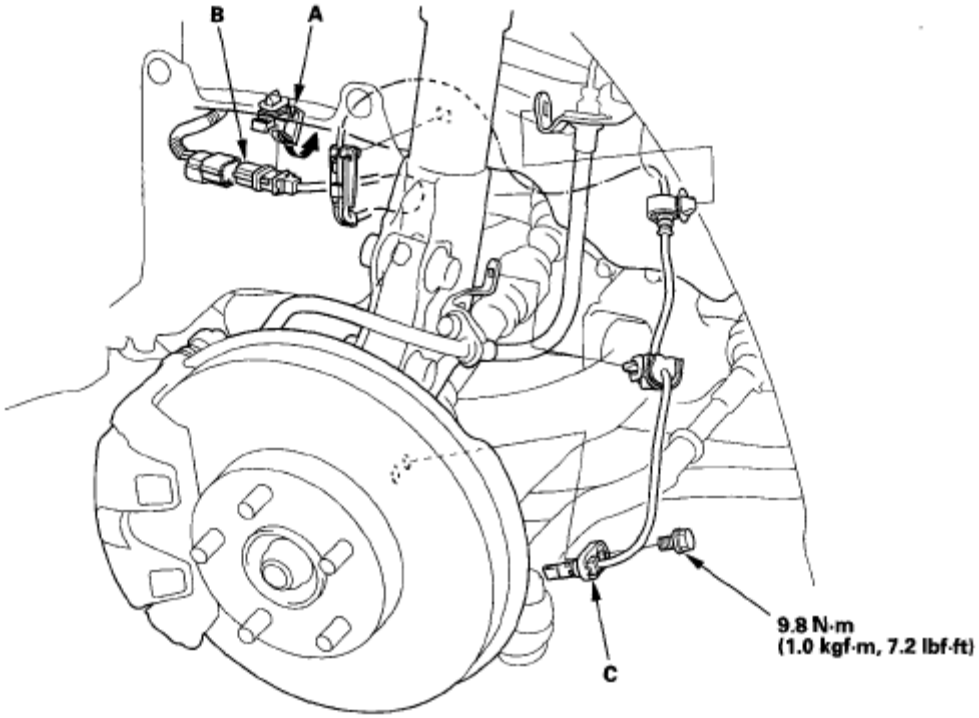


Fig. 71: Identifying Wheel Speed Sensor (Front) (With Torque Specifications)

2. Remove the clips, the bolt, and the wheel speed sensor (C).
3. Install the wheel speed sensor in the reverse order of removal, and note these items:
   - Install the sensor carefully to avoid twisting the wires.
   - If the wheel speed sensor comes in contact with the wheel bearing, it is faulty.
4. Start the engine, and check that the ABS and the VSA indicators go off.
5. Test-drive the vehicle, and check that the ABS and the VSA indicators do not come on.

REAR

1. Release the clamp (A), then disconnect the wheel speed sensor connector (B).

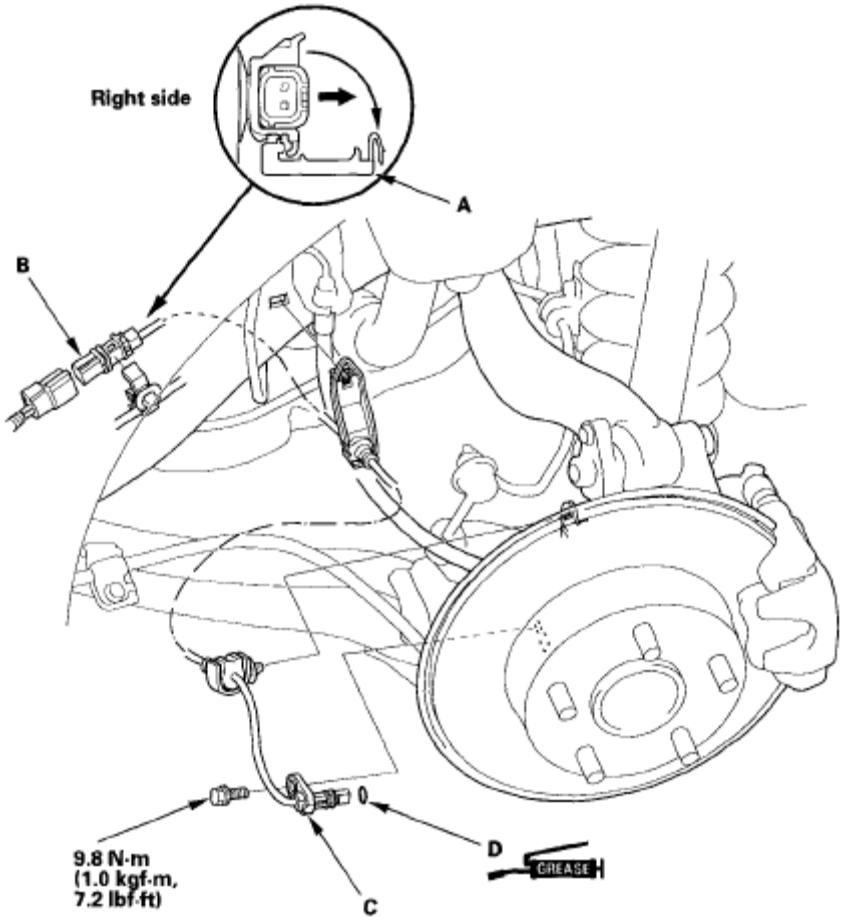


Fig. 72: Identifying Wheel Speed Sensor Connector (Rear) (With Torque Specifications)

2. Remove the clips, the bolt, and the wheel speed sensor (C).
3. Install the wheel speed sensor in the reverse order of removal, and note these items:
   - Apply multipurpose grease to the O-ring (D).
   - Install the sensor carefully to avoid twisting the wires.
   - If the wheel speed sensor comes in contact with the hub bearing unit, it is faulty.
4. Start the engine, and check that the ABS and the VSA indicators go off.
5. Test-drive the vehicle, and check that the ABS and the VSA indicators do not come on.